THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXVI. No. 914.] LONDON, NOVEMBER 16, 1880. [32ND YEAR. Price 6d.

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BY
OXIDE OF IRON.

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From ½ to 40 H.P. ind.
See Advertisement in last week's JOURNAL, page 718.

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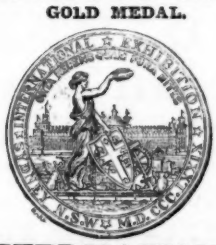

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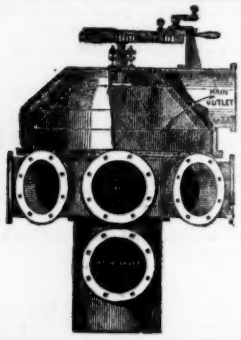
Now ready, GAS CHANDELIER BOOK (Reduced Prices), 7s. 6d.



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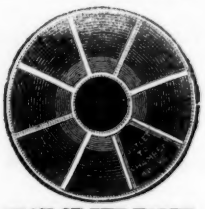

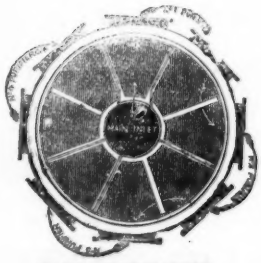

ELEVATION OF THE CENTRE-VALVE. PLAN OF THE VALVE. PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

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HAVE BEEN AWARDED TO
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Being the Highest Honour given for this class.

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THE UNVARYING WATER-LINE GAS-METER,
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MANUFACTURERS OF EVERY DESCRIPTION OF

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Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

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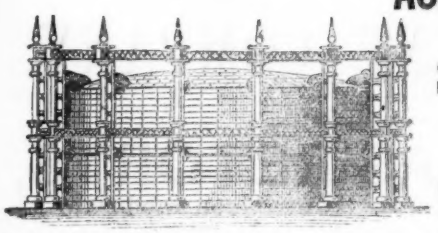

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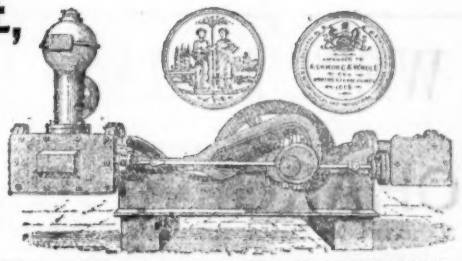

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For Water, Tar, Grains, Soap, Thick Fluids, Chemical, Gas, or Iron Works, Mines, Breweries, Ships, &c.

No possibility of Valves sticking, as they are actuated by positive motion from an eccentric.

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The Comptoir Général of Gas and Water Works is authorized by a leading Company to **Buy Gas and Water Works and Concessions.**

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INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

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NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

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RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

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LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

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And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

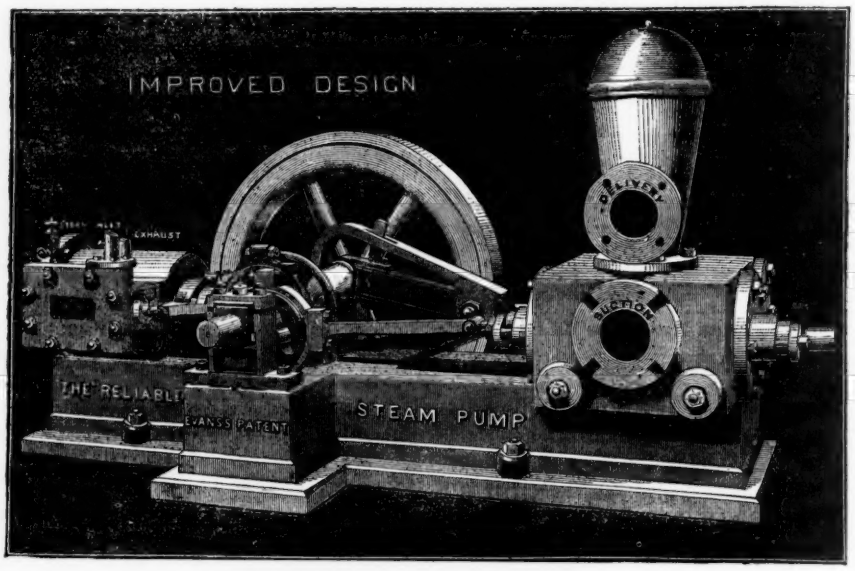
A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

THE "RELIABLE"

IS

THE PUMP FOR TAR AND THICK FLUIDS.

THE ONLY REVERSIBLE PUMP IN THE WORLD.



NEARLY 50 SUPPLIED TO THE GASLIGHT AND COKE COMPANY, LONDON.

PATENTEES AND SOLE MAKERS:

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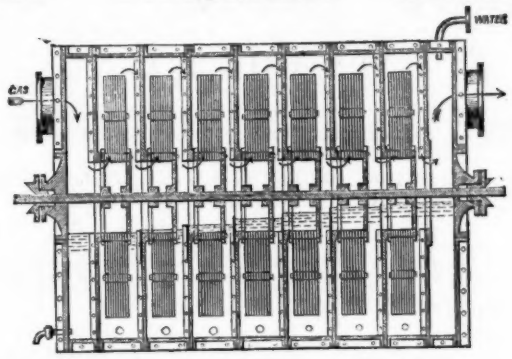
ALSO THE "CORNISH" DIRECT-ACTING STEAM-PUMP.

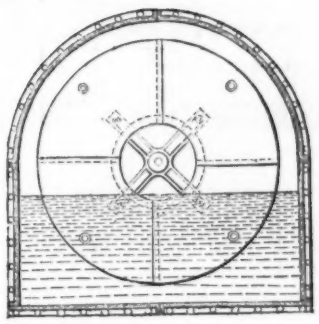
THE "RAM" FLY-WHEEL PUMP.

HAND, HORSE, AND STEAM PUMPS FOR EVERY PURPOSE.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER COMPANY.





These Machines contain from 3200 feet to 65,000 feet of Wetted Surface.

The Special Merits of this Washer are as follows:—That it is not necessary to reduce the temperature of the gas to 60°, or thereabouts, to make it effective; and that as no tar is retained in it, the illuminating power is not reduced as in Tower Scrubbers. That the distribution of the liquor is made with unerring regularity. That it occupies very small space, so that it can be, at little expense, effectually protected from extreme changes of the weather. That the considerable expense of Coke or Wood, or other Scrubbing Material, is entirely saved, and that the great nuisance and cost of from time to time replacing the Scrubbing Material is avoided. That, by the revolution of the discs, the quantity of water carried up by them, and tending continuously to fall, exposes a very large amount of fresh wetted surface to contact with the gas as it ascends. That it is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured. That it is much cheaper than any other Scrubber that will do the same amount of work effectually. That it is the only Washer suitable for purifying Gas from all its impurities by solution. That it works with a minimum of pressure. That it takes out every trace of Ammonia from the Gas in once traversing the machine, as well as a very large quantity of carbonic acid and sulphuretted hydrogen. That it requires very little outlay for foundations.

The following Testimonials show the opinion of eminent Engineers as to the capabilities of the Washer:—

Messrs. Kirkham and Hersey. *The Gaslight and Coke Company, Beckton, North Woolwich, June 8, 1880.*

Gentlemen,—I enclose you some particulars of the working of your Washers here, and I intend having some more experiments made, as just now we are working the first Washer with liquor and the second with water. Of course the fact of our having ordered two more, in addition to the four which we have in use, is a sufficient indication of my opinion of the value of the Washer.

(Signed) G. C. TREWBY.

Messrs. Kirkham and Hersey. *South Metropolitan (late Phœnix) Gaslight Company, Engineer's Office, June 19, 1880.*

Dear Sirs,—The "Standard" Washer which you supplied for use at our Vauxhall station has afforded me entire satisfaction. It was designed to remove the ammonia from 3 million cubic feet of gas per day, and during the past winter it did so with a good working margin to spare. It is as excellent now in workmanship as in design, and is well worthy of the general acceptance with which it appears to be meeting.

I am, faithfully yours, (Signed) CORBET WOODALL.

Messrs. Kirkham, Hulett, and Chandler. *The Gaslight and Coke Company, York Road, King's Cross, Jan. 14, 1879.*

Gentlemen,—In reply to your inquiry, I am pleased to say the Washer which was put in action at this station in October last has quite fulfilled my expectations, as it confirms the experiments I made in May last with the smaller machine. Working at four revolutions per minute, it takes out every particle of Ammonia, while purifying more Gas than it was intended to do. I enclose particulars of a week's working during our heaviest make, by which you will see that it yields the full quantity and strength of liquor, and works with little pressure. I am therefore quite satisfied with the machine, and trust it may meet with the success it deserves.—I remain, &c., (Signed) JOHN CLARK, Engineer.

Messrs. Kirkham, Hulett, and Chandler. *Corporation of Birmingham, Gas Department, Saltley Works, May 23, 1879.*

Gentlemen,—I beg to enclose you a copy of the results of the tests which, by the kind permission of the Engineer, Mr. Clark, I made on the 6th of March last, of the working of one of your "Standard" Washers and Scrubbers at the St. Pancras Station of The Gaslight and Coke Company, and I am of opinion that, for an apparatus occupying so small a space, they are exceedingly satisfactory.—Yours truly, HENRY HACK, Engineer.

Messrs. Kirkham and Hersey. *The Leeds Corporation Gas-Works, Meadow Lane, Aug. 14, 1879.*

Gentlemen,—In reply to your inquiry of yesterday's date, I have pleasure in stating that the item appearing as income derivable from Ammonia in my estimate of revenue for current year is not an exaggeration. Our average income from Ammonia is 2s. 8d. per ton of coals carbonized, but at the works where your invention is in use we derive not less than 3s. per ton. Since the introduction of efficient Scrubbers at our works the greater yield of this product (now twice as valuable as coke to us) is such that the cost of Apparatus for its extraction can be wholly paid for out of from nine to twelve months gains. I am, Gentlemen, yours faithfully, (Signed) H. WOODALL, Engineer.

Messrs. Kirkham and Hersey. *Heywood Local Board Gas-Works, Hooley Bridge, Heywood, Dec. 1, 1879.*

Gentlemen,—In reply to your favour of the 28th ult., I beg to state that the Scrubber is at work, and doing well. I shall be glad to show it to any inquirers.—Yours truly, (Signed) EDWIN BUCKLEY, Engineer.

Dukinfield, Denton, and Haughton Gas-Works, Dukinfield, July 31, 1880.

Messrs. Kirkham, Hulett, and Chandler, Limited, 59, Palace Chambers, Westminster.

Gentlemen,—We commenced the use of your "Standard" Scrubber on the 1st of February last, and from that date to the end of June we had passed 168¼ tons of Ammoniacal Liquor of 6° strength into the tar well, as indicated by a liquid-meter. This liquor being sold at 19s. per ton realized £160, which was a clear gain to us of 1s. 0½d. per ton of Coal carbonized, due to the use of your Washer, in addition to which there was a saving in the cost of purification.

During the above period we had removed the Ammonia from 28¼ million feet of gas, and as we make 81 millions yearly, the saving, at the same rate, would be £460 per annum. The Apparatus (without foundations and connections) cost £420, so that it will pay for itself within twelve months of its erection. I am, yours truly, (Signed) HARRISON VEEVERS, Engineer and Manager.

Messrs. Kirkham, Hulett, and Chandler, Limited. *Leominster Gas and Coke Company, Limited, March 20, 1880.*

Gentlemen,—In reply to yours of the 18th inst., we have a 3½-horse power "Otto" Silent Gas Engine; this drives by belt a 5000 feet per hour Beale's Exhauster, Tar, Liquor, and Water Pumps, and your "Standard" Washer-Scrubber. The engine is easily managed, and is sufficient for nearly double the work it has yet had to do. I think 1 to 1½-horse power engine amply sufficient for a Washer 7000 to 10,000 feet per hour.

With regard to your Washer-Scrubber, it causes a very decided improvement in the illuminating power of the gas—say 1¼ candle; it is now 17 candles by No. 1 Sugg's Argand burner. Clear water supplied at the rate of 10 gallons per ton of coal comes out 5° to 6° Twaddel, and we find the purifiers much freer from tar, and requiring less lime.

Our Working Manager says your Washer is the best machine that ever came into the works.

Yours truly,
(Signed) JOHN F. SOUTHALL.

For further particulars and testimonials, address Messrs.

KIRKHAM, HULETT, & CHANDLER, Limited, { 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.

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WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

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FOR
GAS PURIFIERS & SCRUBBERS.

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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
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BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

JAMES OAKES & CO.,
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AND
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Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

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Patent Gas Calorigen,
A STOVE FOR
WARMING AND VENTILATING.
RECOMMENDED BY DR. RICHARDSON.

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GAS, WATER, & STEAM.

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SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS,
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
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3 feet 6 inches.

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GAS OR OIL
HEATING AND LIGHTING
STOVES.

Silver Medal awarded in 1878, at Wolverhampton Exhibition.

No Injury to Pictures or Plants.
No Flue.
No Danger from Fire.

No Offensive Smell.
Light and Warmth combined.
Cost less than other Fuel.

Messrs. RITCHIE & Co. are prepared to supply these Stoves on the best possible terms to Gas Companies to let out to their Consumers on the hire system.

Prices from £3 3s. to £10 10s.

Full Particulars and Testimonials forwarded on application to
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3 feet 6 inches, 5 feet, and 6 feet.

For Heating only. For Light & Heat.

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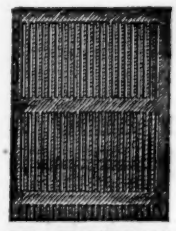
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MADE BY SPECIAL MACHINERY.
SCRUBBERS FILLED WITH BOARDS,
On our approved principle, for the extraction of Ammonia.
Prices on application. References to First-Class Engineers.
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J. & J. BRADDOCK,
GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET & DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
BRADDOCK'S PATENT COMPENSATING GAS-GOVERNORS;
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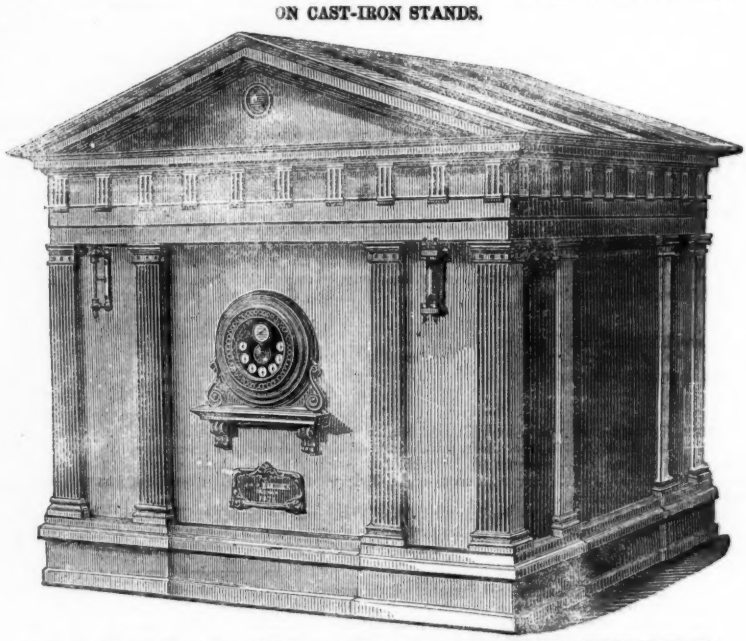

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WITH PLANED JOINTS.
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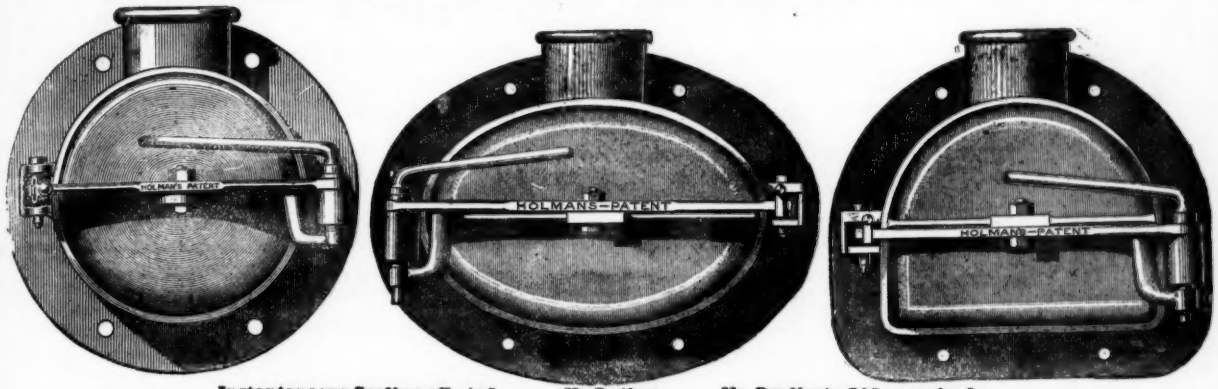
TANGYE BROTHERS AND HOLMAN,

CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,
Anti-Friction Catches, and Self-Sustaining Cross-Bars.



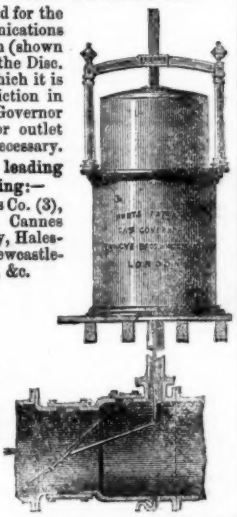
Instantaneous Sealing effected. No Luting. No Duplicate Lids required.
Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Morton's Patent Retort-Lids are in use in nearly all the Principal Gas-Works in the United Kingdom and the Colonies; also on the Continent and in the United States of America. They are now made of the

SAME FORM OR SECTION AS THE RETORT. (See Illustrations above.)

Engineers preparing Specifications of New Works will be furnished with Dimensions of Stock Patterns, together with Approximate Weight and other data on application.

HUNT'S
EQUILIBRIUM DIRECT-MAIN GAS GOVERNOR.



In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight & Coke Co. (19), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Leicester, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

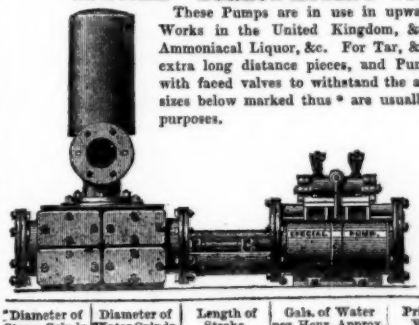
The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,
(Signed) JOHN JOHNSON.

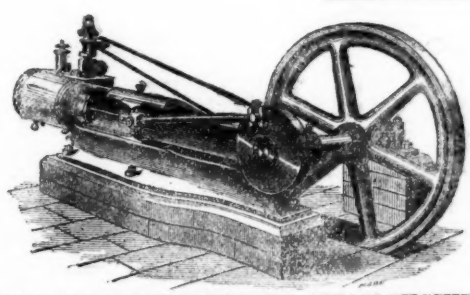
THE
"SPECIAL" DIRECT-ACTING STEAM-PUMP.



These Pumps are in use in upwards of one hundred Gas-Works in the United Kingdom, &c., pumping Water, Tar, Ammoniacal Liquor, &c. For Tar, &c., they are provided with extra long distance pieces, and Pumps are entirely of iron, with faced valves to withstand the action of the liquid. The sizes below marked thus * are usually kept in stock for these purposes.

The quantities delivered of Tar should be taken about two-thirds that of water.

Diameter of Steam Cylndr.	Diameter of Water Cylndr.	Length of Stroke.	Gals. of Water per Hour, Approx.	Prices for Water.	Prices for Tar and Ammoniacal Liqr.
*3 in.	1¼ in.	9 in.	450	£16 0 0	£17 0 0
*4 ,,	2 ,,	9 ,,	815	18 0 0	19 0 0
*5 ,,	2¾ ,,	12 ,,	1,250	21 0 0	22 10 0
*5 ,,	3 ,,	12 ,,	1,330	22 10 0	24 0 0
*6 ,,	3 ,,	12 ,,	1,830	25 0 0	28 10 0
*6 ,,	4 ,,	12 ,,	3,250	30 0 0	31 10 0
6 ,,	5 ,,	12 ,,	5,070	35 0 0	36 10 0
*7 ,,	5 ,,	12 ,,	5,070	40 0 0	41 10 0
7 ,,	6 ,,	12 ,,	7,330	45 0 0	46 10 0
*8 ,,	6 ,,	12 ,,	7,330	50 0 0	52 0 0
10 ,,	6 ,,	12 ,,	7,330	60 0 0	62 10 0
10 ,,	8 ,,	12 ,,	13,000	75 0 0	77 10 0



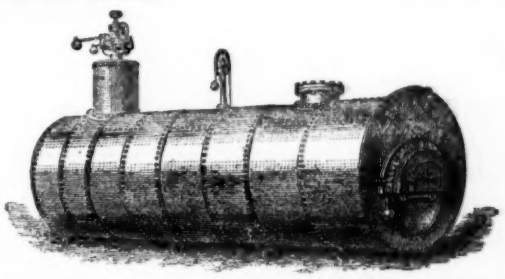
TANGYE'S HIGH-PRESSURE STEAM-ENGINE,

NEARLY 4000 IN USE.

The Design, Workmanship, and low prices of these Engines have called forth universal approval.

Nom. H.P.	2	3	4	6	8	10	12	14	20	25
	£28	£37	£44	£68	£86	£111	£122	£133	£185	£215

Including Governor and Feed Pump. Variable Expansion extra.



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This Department having been greatly extended and furnished with the most approved Boiler-making Machinery and Tools, T. B. & H. are prepared to supply all kinds of Steam-Boilers with great facility at lowest current prices.

Also Makers of IMPROVED HYDRAULIC HOISTS, TRAVELLERS, CRABS, CRANES, PULLEY BLOCKS, HYDRAULIC AND SCREW LIFTING JACKS, LATHES, PUNCHING AND SHEARING MACHINES,
And all other Descriptions of Tools, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, &c., ON APPLICATION.

London 51.

New York, 1863.

Paris, 1855.

London, 1862.

Dublin, 1865

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

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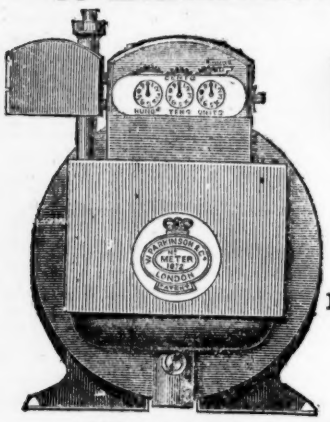
THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS.

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON AND CO.

(ESTABLISHED 1816)



WET & DRY METERS,

STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

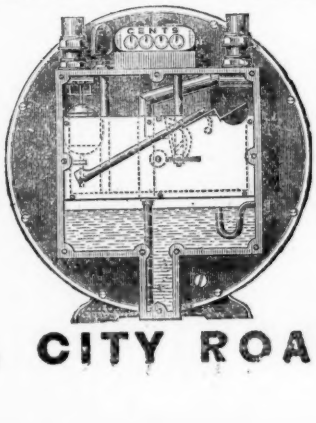
PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.

SOLE AGENTS FOR

FOULGER'S PATENT SEAL UNIONS & CUTTING-OFF CAPS.

HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

ONE WHO WOULD LIKE TO KNOW.—*Your inquiry should be addressed directly to the gentlemen you name.*

F. AND O.—*No reference having been made to you, in the report to which you call attention, letter can only be inserted as an advertisement.*

J. H.—*Will look over the figures sent in reference to the South Australian Company's working, and have no doubt shall find something interesting to extract for* JOURNAL.

M. P. B.—*Why did you not send report before? The date of it (Aug. 19) will prevent reference being made to it in our columns unless something very special is noticeable on looking it through, which shall be done in the course of the week.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 16, 1880.

Circular to Gas Companies.

A CASE of great importance, bearing on the relations between Highway Authorities and Gas Companies and others having the right of laying pipes under the surface of roads, was tried at the Thames Police Court on Tuesday last. We shall give next week a full report of the proceedings, which are highly interesting; in the meantime, the facts may be shortly stated as follows:—The Surveyor to the Vestry of Mile End Old Town, on behalf of the Vestry, summoned The Gaslight and Coke Company for neglecting to reinstate a certain road which had been opened by the Company in September last, for the purpose of examining the joints of their gas-main, and making good leaks in the same. The holes dug for this purpose were about eight feet long by six feet wide, and were necessarily only a few feet apart. The road had been repaired and macadamized by the Vestry during the past summer, and the surface finished off by a steam roller. It was now contended that the Company, being liable to reinstate the road in as good condition as it was in when they commenced operations, should have finished the surface by the same means as had been adopted by the Vestry—by a steam or other heavy roller—and this they were required by the Surveyor to do; and he also demanded that every hole should be covered, under the macadam, by a slab of concrete resting on the undisturbed ground all round the opening. Both demands were resisted by the Company, on the grounds that the means actually used by them for making good their openings, by filling and hand-ramming, were the best that they could employ; that they could not be compelled to use a steam roller for finishing the surface; that they were not liable to put in a concrete slab where nothing of the kind had previously existed; and that generally, as long as they maintained the road fit for traffic, in accordance with the provisions of the Gas-Works Clauses Act, 1847, they could not be called upon to conform to any fanciful requirements of the Surveyor. It was further alleged on the part of the Vestry that the filling in and making good of the openings had been carelessly done, even for the manner of procedure adopted by the Company; but this was disproved by the evidence, and it was even stated that the cross section of the road is now of truer shape where the Company had broken it up and re-made it than where it had not been touched. The Company urged that, so far from there being any necessity for the use of a steam roller, it was the action of that machine, as employed by the Vestry in the summer, which caused their main to leak, and necessitated their coming so shortly afterwards to break up the road and repair their pipes, at an estimated cost of over £2000. It was also pointed out that the action of the Vestry was premature, as by the Act the Company are liable to maintain, for a period of twelve months, any road they may break up, and there could be no question that in the present case they had in any way attempted to shirk their liability, the most that was alleged being the existence of a disinclination on their part to carry out the precise wishes of the Surveyor. Upon this point the decision of the Magistrate principally rested. He dismissed the summons with costs, on the ground that the Company had done all that is required by the Act, for the time already expired of the entire period during which they will be responsible for the state of the road in question. The Magistrate also held that the Company were only bound to conform to the *reasonable* requirements of the Highway Authority, which did not extend to any preference the latter might have for a particular method of road-making or repairing.

The Magistrate's decision is very valuable to all parties interested in such matters, and it decidedly possesses the merit of being a common-sense rendering of the provisions of the Act of Parliament. If it had been decided that a Road Surveyor can impose his conditions as to the manner in which a road is to be made good, as well as pass judgment on the work when it is done, the trouble and expense to which Gas and Water Companies in particular might in future be subjected would be enormous. Road Surveyors with a fondness for the biggest and heaviest steam rollers to be obtained, and with which they love to batter a roadway into shape in a few hours, may be expected to believe a Gas Company actuated by personal malevolence when they almost immediately proceed to dig holes and trenches in the newly-made street, for the purpose of seeing what effect the roller has had upon their own property. It would, in such cases, be an immense gratification to the Surveyor if he could compel the Company to roll the site of their openings in the manner favoured by himself, and override their objections to the instantaneous macadam-crusher. But if the precedent just made be followed, it will be borne in upon the minds of Highway Authorities that the best way to prevent that disturbance of the roads which is so annoying to them, of such danger and inconvenience to the public, and so costly to the unwilling agents thereof, is to avoid the use of any appliances for finishing a road surface which will damage underlying property; otherwise, the objects they desire to attain may be lost by the same means they may deem best calculated to secure them.

We are to-day enabled to make the gratifying announcement that from Christmas next the price of gas over the whole of the South Metropolitan Company's district will be reduced to 2s. 10d. per thousand cubic feet. This is equivalent to a reduction of rather over 5½ per cent. to the consumers, while by the action of the sliding scale the dividends of the Shareholders of the Company will, of course, be increased. Still it is from the point of view of the consumers that the promised reduction will be more generally regarded; especially in consideration of the fact that the gas supplied at the lower figure will be of greater purity by law, if not in fact, after the present winter. In reality the South Metropolitan Company's gas is as generally free from sulphur as that manufac-

tured under more stringent regulations; hence the imposition of a higher standard will have the effect merely of abolishing a certain latitude which has lately been seldom or never indulged in by the Company. It will, however, be as well to have it established by authority that the cheapest gas in London will be also classed with the purest. The impending reduction of the price of gas in any district of the Metropolis below the three-shilling low-water mark to which it has not even yet receded in every part of the capital, is a notable event, and one that will, perhaps, exert a very wide influence. The actual reduction is but twopence per thousand feet, it is true, but this twopence abolishes the long-established rule of the oscillation between the three-shilling and the four-shilling rates. For the first time for some years, a new figure will be introduced into the shillings column of the selling prices of London gas, and this will also bring the price of the South Metropolitan Company's gas within a measurable distance, in the popular estimation, of any cheap provincial gas supply. This contemplated step on the part of the Company is possibly to be regarded as less an act of grace than a necessity arising out of past legislation, consequent on favourable present circumstances, and as such it will probably be carefully noted in certain quarters. But this is not the best key to the situation. It may be said that the possibility of such a reduction being made is an argument for further pressure being applied to enforce continual efforts in the same direction, and it may be expected that something of this kind may be heard of during the ensuing year. Against this it can be urged that it would not be altogether advisable to attempt to turn a progressive Company's beneficial action towards the public, to their own discomfiture. Progress, although such a universal rule, is only an effect and not a cause; it may be fostered or hindered, and either process may be due in any particular case to very complex operations indeed. Where the former action is observed to obtain under certain conditions, those conditions should be allowed to continue in force, for fear lest hasty effort to improve their action may result in extinguishing it, or causing it to assume a different character. It is only to be expected that the South Metropolitan Company will soon need extended manufacturing facilities, at the present rate of increase in the consumption of their gas. They have taken the best, and indeed the only practicable course open to them, by giving notice of their intention to promote a Bill in the next session of Parliament for power to acquire some hundre dacres of land below Greenwich, and it may be hoped that their proceedings in this respect will not be attended with undue trouble and expense. The recent amalgamations have not put them in command of much disposable land, and it is absolutely essential to the Company's undertaking, not only to have a fresh and ample site, but also that such site shall be capable of being turned to the best account for the supply of their large and rapidly-growing district.

An illustration of the difficulty sometimes experienced in working the machinery of local government is just now afforded by the town of Bolton. The same instance may also be brought forward to show that the safe and trustworthy management of gas undertakings and other public property by representative bodies depends upon the mutual good-will of the various sections into which the members of such bodies may be divided. A Gas Committee of a Corporation have to reckon with more factors than need be regarded by the Directors of a Company carrying on the same kind of business. They have not only their customers to consider, and also the ratepayers, who stand in a position regarding the undertaking somewhat analogous to that of the proprietors of a Company, but beyond and above all the Committee of a Town Council must observe the peculiarities of their fellow-councillors, if they do not wish to live in perpetual conflict with them. With all this there can never be any security for the Committee against harassing attacks and "obstruction" from their brethren of the Council, and it does not require much acuteness to see that serious results may easily follow a persistence in tactics of this nature, when directed against a trading concern. In Bolton, the consumption of gas has been steadily increasing of late years, and it appears to be pretty generally conceded that additional works are absolutely required, if the Corporation are to keep faith with the inhabitants of the district in which they have undertaken the responsibilities of gas supply. This necessity was recognized five years ago, but the demands of the public have so far been met by extensions of plant at the existing manufacturing stations. Now, however, the time has come when a fresh station must be established, and accordingly a site has been found, and purchased provisionally, pending legislative sanction for the proposed extensions. Several Committees, besides the Gas Committee, finding themselves in need of further powers at the same time that the latter wish to go to Parliament, an Improvement Bill has been drafted for next session, and in this Bill the whole are included. The Town Council had decided to proceed with the Bill, but a violent minority bitterly opposed it, and at the town's meeting called for its consideration the minority of the Council were in the ascendancy, and the proposal was negatived; whereupon a poll was demanded by the supporters of the Bill, and this final appeal to the ratepayers was recently sanctioned by the Council. The opponents of the Bill maintain that the gas is the only pressing matter contained in it, and that the desired powers can therefore be obtained by Provisional Order, while the other matters can stand over indefinitely. The motive for advocating an Order is, of course, its supposed economy as compared with a Bill. Unfortunately for the friends of the former procedure, it is by no means clear that the Local Government Board have power to grant such an Order as is required, to enable the Sanitary Authority to make gas for supply beyond their own district. A case was submitted to Mr. Pope, Q.C., wherein this point was stated, as also an inquiry whether one Order could be made to include several objects. The opinion of Counsel on the first point is simply to the effect that the Local Government Board have not any such power; although he is careful to add that the Board sometimes *do* things beyond their powers, and if the confirming Act slips through unopposed, he *supposes* they stand. As to the second question, Counsel sees no legal obstacle to such a course; but, as a matter of practice, he states that separate Orders for distinct purposes are usually granted.

Returning to the first point—the desired Gas Order—we should imagine that there cannot be the slightest doubt respecting the soundness of Mr. Pope's view. Any Order the Local Government Board might grant would be worthless until confirmed, and if opposed at any stage, the entire expenditure of time and money involved would be absolutely lost, to be borne by the petitioners, who would then have to proceed by Bill after all. If economy be the motive of the minority of the Bolton Town Council, they are bent on a queer way of ensuring it. They should have known that the contemplated amendments of the special Corporation Act are not possible by any other means than a new Act, and that Provisional Orders were never intended to apply to cases such as that of the Bolton gas supply. For want of this knowledge the Council have involved their town in the cost of a poll, to be added to the other expenses of the inevitable Bill, and for all this they plead their devotion to economy! Bolton was one of the typical cases referred to in last week's "Circular," wherein general politics are said to influence municipal management to an abnormal extent. If this be so, these remarks may with advantage be read as an appendix to the article referred to.

We have had occasion to notice an action between Mr. Davis, of Westgate-on-Sea, and the Isle of Thanet Gaslight and Coke Company, respecting the definition of the Company's limits of supply, which was decided by the Master of the Rolls adversely to the Company. The case turned chiefly upon the meaning of the word "adjacent," occurring in the description of the Company's district in their special Act, and it was held that this did not include a spot three miles beyond one of the Company's named centres of operations. The subject was of importance to both parties in the action, as Mr. Davis had gas-works and mains of his own, with which he was supplying a newly-settled population, as well as an older body of consumers, the two together forming a snug connection, lying, as the Company believed, within their prescribed district. It appears that the Company had at one time been asked to supply with gas from their nearest station the nascent colony of Westgate, but they did not at once think fit to do so. Meanwhile, the then proprietor of the Granville Hotel at Ramsgate, despairing of obtaining a supply of gas from the Company, purchased the existing works at Birchington, which the Company had permitted to exist, probably because of their insignificance, and proceeded to enlarge them for his own purpose. Westgate soon became populous and fashionable, and the Thanet Company thereupon began to awake to the sense of their folly in neglecting it; but meanwhile it had been otherwise provided for, and Mr. Davis, who had succeeded the earlier proprietor of the estate, defied the Company, with the result stated. Mr. Davis failed in an attempt to carve a parliamentary district for his own undertaking, and as the Company also failed to prove their right to the locality, it became a kind of no-man's-land. It should be stated that a proposal for the sale of Mr. Davis's works to the

Thanet Company was made without result. Now we see that the Company intend to apply in the ensuing session for power to define their district, so as to include the disputed ground. Mr. Davis will probably not object to this if the Company give him a fair price for his property, and undertake to supply his customers and his own establishment at a reasonable rate; but unless the Company are prepared to do this, it may be hoped, for the sake of right and justice, that they will not be permitted to ride roughshod over a man whose sole offence, so far as we can see, lies in having, by his own enterprise, occupied a position that was yielded by their supineness.

After passing through some vicissitudes, the proposal of the Aire and Calder Navigation Company to sell their gas-works to a hybrid Company composed of the Goole Local Board, the public, and themselves, for £33,000, has been accepted by the Board, subject to the consent of the Local Government Board and the ratepayers. There was some haggling about the terms of the purchase down to the day when the Board finally made up their minds to accept the terms of the Navigation Company, and they finally agreed to the proposal only after a promise had been exacted from the Company to make certain improvements in the works and mains, at a net cost of about £600. The matter has been repeatedly mentioned in our columns, because of the peculiar constitution of the proposed proprietary of the undertaking, which is also mixed up with schemes for water supply and sewerage, so that it is impossible to separate the conflicting impressions prevalent in the local mind regarding the three projects. The Board have, however, done a sensible thing at last in coming to a decision on their part of the preliminary negotiations. The price to be paid for the works is very near that stated by the valuer employed by the Board, and they have done well to hasten the reference of the whole business to the final authorities.

The Barnsley people are clamorous for a reduction in the price charged by the local Company for gas. The price is now 3s. 9d. per thousand cubic feet, and a deputation of the consumers has had an interview with the Directors of the Company to demand a reduction of one shilling, or at least ninepence per thousand cubic feet. The price certainly appears to be rather high, and it will perhaps be found advisable to lower it at the end of the current quarter, although, of course, it would be impossible to make such a sudden drop as the deputation required. It will, however, probably be found that in this as in other cases, more was asked than was expected, with the object of getting at least something. We quite agree with the contention of the deputation, that the Company's business would increase in consequence of a substantial reduction in their selling price, in support of which one or two gentlemen expressed their willingness to burn more gas when it is made cheaper. We trust that, if their wishes are acceded to, the enlarged consumption will not form the subject for future complaints that, when gas is cheaper, gas bills retain their old proportions. In all probability the Company will see their way to a reduction of threepence or fourpence per thousand feet, as an earnest of good intentions, with a promise of further concessions if warranted by a sufficient response from the public.

The enterprising Directors of the Sheppy Gas Company, who supply Sheerness and the neighbourhood, have issued a neat little four-page pamphlet for distribution among non-consumers, in which the general advantages of gas, and particular items of information respecting the Company's own business, are plainly described. The Company were very early in the field with offers to supply intending consumers with gas-fittings of all kinds on hire or deferred purchase, and the present publication is but another testimony of their desire to extend their connection and obtain the confidence of the inhabitants of their district. It is not stated that the Directors employ an experienced tract distributor to dispense their unpretending leaflet, or how they manage to circulate it. Its very smallness is in its favour, and should ensure its perusal by those who may be too incurious to consult a larger publication. Mr. A. W. Marks, the Secretary of the Company, expresses his willingness to forward a copy to any one sufficiently interested to send a stamped envelope for the same; probably with the desire of seeing his procedure copied elsewhere.

At the last meeting of the West of Scotland Association of Gas Managers, Mr. D. Bruce Peebles described in detail his ingenious arrangement for registering the consumption of gas in street-lamps, by means of a clock connected to the lamp-cock in such a way that the clock is set in motion by the movement of turning on the gas, and stopped when the cock is shut. The burner being fitted with one of Peebles's governors, which regulate the consumption of gas to any desired rate per hour, the number of hours during which the clock has been working in a given period multiplied into the rate of burning gives the consumption, without reference to a meter. The advantages of such an arrangement are very obvious, the space required for the clock being much less than for a meter, and it is capable of being more readily examined. Mr. Peebles may perhaps experience some difficulty in inducing public authorities to rely upon his apparatus, but there is no valid reason why it should not be successful. Another useful application of Mr. Peebles's clock system of measurement might certainly be found, as claimed by him, in the convenient registration of gas consumed for special purposes, or for temporary occasions, when the use of a meter would not be possible.

The Southern District Association of Gas Engineers and Managers held a quarterly meeting in London on Thursday last, under the presidency of Mr. James Hunter, when there was a fair attendance of members to hear Mr. Goddard, of Ipswich, descant on the manufacture of sulphate of ammonia. Mr. Goddard's paper was eminently practical, as befitted the subject, and a great deal of very interesting matter was brought forward in the course of the subsequent discussion. The usual question of the comparative benefits of selling ammoniacal liquor off the premises or working it up on the spot was, of course, mooted. The answer to any querist on this matter must be with strict reference to the particular circumstances of the case. There is plenty of information to be obtained as to the yield of sulphate from coal, and the cost of its manufacture. With these factors to work with, and the conditions of sale being ascertained, there can be no difficulty in determining whether it will pay better to sell liquor or manufacture it into salts on the spot.

Water and Sanitary Notes.

As might be expected, the Metropolitan Board are beginning to show a feeling of annoyance at the activity and pretensions of the Delegates who profess to represent the Vestries and District Boards of the Metropolis at the meetings over which Mr. E. J. Watherston presides in the Vestry Hall of St. Martin's-in-the-Fields. These Delegates have presumed to communicate with the Home Secretary in the name of their Vestries, and have also sent out a circular to sundry provincial authorities, requesting particulars as to the local water supply. It is argued that the Delegates only represent about one-third of the total number of Vestries, and doubt is raised whether the Vestries really know or approve what the Delegates are doing. Beyond all dispute, Mr. Watherston's conclave is a very irregular and informal assembly, though it possesses in that gentleman an able Chairman, and in Mr. James Beal a veteran Secretary. There is one consolation, that the Delegates are not likely to spend £16,000 on the water question, to be subsequently charged on the ratepayers by means of a Bill of Indemnity.

"One Puzzled" writes to the *Globe* to know what is to be understood by the phrase "unfit for dietetic purposes," as applied by Dr. Frankland to a large portion of the Metropolitan Water Supply. In plain English, the term would seem to signify that the water in question was "not fit to "drink." Yet those who drink it constitute a very large portion of the inhabitants of London, and the health of the Metropolis continues to be remarkably good. It is an anomaly which no one but Dr. Frankland can explain, that millions of people are able to drink water "unfit for dietetic purposes" day after day without being any the worse for it. The authority with which Dr. Frankland speaks on this subject is almost amusing when we compare his conclusions with the small substratum of fact on which he has to build. Dr. Frankland professes to be in a position to report on the state of the Metropolitan Water Supply "during" the month of October. But on looking at his table of analyses we find that all his samples of water connected with the supply from the Thames and the Lea were taken on Oct. 19. The sample relative to the Kent Company was obtained on the 18th. Thus all that Dr. Frankland can properly speak of is limited by samples taken on a single day in the course of a month. Five samples out of the seven from the Thames and the Lea are derived from cab-ranks. Results thus obtained are exalted to an importance which seems altogether disproportioned to their true significance. But these analyses, as

expounded by Dr. Frankland in the reports of the Registrar-General, have served to frighten London, though it is to be hoped that the public are beginning to inquire into the meaning, as well as the sound, of the portentous phrases which fall upon the popular ear.

The Sheffield Water-Works Company have gained a decision in their favour from the Master of the Rolls, establishing their right to charge an additional sum over and above their ordinary rates in respect of the use of a bath in a private house. The suit was a test case, the defendant, a Mr. Bingham, being supported by ample funds raised by the "Sheffield "Water Consumers Defence Association." Some ingenious arguments were adduced in opposition to the claim of the Water Company, the main contention on the side of the defendant being that the water required for the bath was part of the supply which the Company were bound to furnish for ordinary domestic purposes. It was argued that the Company were sufficiently remunerated for the water expended on the bath by the addition which such an appurtenance gave to the annual rateable value of the house. There is a clause in the Company's Act which gives them power to charge for water supplied to "baths, ponds or pools, or closets," and for other purposes. The Counsel for the defendant argued that this had reference to "public baths," though it was a little difficult for him to show that the closets could be public. It is rather amusing to find that the Master of the Rolls looked upon the term "pool" as signifying "cesspool," to which a supply of water would be an inconvenience instead of a benefit. The expression "ponds or pools" clearly has reference to ornamental water in gardens. But with regard to the "bath," there was practically no room for doubt, though the ingenuity of Counsel could readily pile up arguments on the subject, mainly founded on a confusion of ideas as between washing and bathing. A "bath," the Master of the Rolls observed, was a "moveable fixture." As it exists in most houses, a bath is no more "moveable" than a cistern —a fact which helps still further to show the reasonableness of the decision arrived at. A regular bath in daily use will consume, as the Judge observed, sixty gallons a day on a moderate computation. If it were only used for 300 days in the year, there would be a direct consumption of 18,000 gallons, independently of waste. To suppose that this is to be given in as part of the ordinary domestic consumption is obviously unreasonable. The supply must be paid for in some shape or other, and the method adopted by the Sheffield Company is both reasonable and legal. The question is now settled, and the decision will confirm the rights of Water Companies in general. To complain, after the manner of one of the Sheffield journals, that an extra charge for a fixed bath is a "tax on cleanliness," is to assert a right to take possession of a commodity without paying for it, on the plea that it is to be used for a good purpose.

The prospect of a greatly increased demand for water which impelled the Manchester Corporation to obtain an Act for drawing a supply from Thirlmere, has failed thus far to be verified. From a lengthened and interesting statement in the *Manchester Examiner*, it appears that instead of the demand for water in that city going on at a rapidly increasing rate every year, it is now only a few thousand gallons more per day than it was in 1875. In 1874 and 1875, Mr. J. F. Bateman alarmed the Corporation by statements, based on authentic figures, showing that the demand for water, if sustained in its progress, would soon outstrip the supply. Thus it was stated: "The demand for water, both in and "out of the city, is going on at a rate three times as fast as the "increase in the population." Hence the felt necessity for further provision to meet the expected demand. It is said to be due to the energy and foresight of Alderman Grave, and his intimate knowledge of the Thirlmere district, that the Water-Works Committee of the Corporation were induced to take up the enterprise which now awaits execution. At present the Committee have on their books about 200,000 open accounts for domestic and trading purposes. The population represented is very nearly a million, residing on an area of ninety square miles, the revenue for the present year is about £216,000, and there is in every house a constant supply direct from the mains, but the consumption is only twenty gallons per head per day, a strict supervision being exercised to prevent waste. The Water-Works Committee are debarred from making profits to distribute in the relief of rates, and hence they are the more disposed to improve and enlarge the supply. The present consumption is 18 million gallons per day for domestic and trading purposes, with 16 million gallons per day for six days per week for compensation. Mr. Bateman's estimate for the completion of the Thirlmere scheme was £3,500,000, comprehending a supply of 50 million gallons per day over the present quantity. But it must be remembered that in drawing water from Thirlmere, Manchester has undertaken the responsibility of supplying reasonable demands for water on the way. As for the prospects of the undertaking, our Manchester contemporary signifies that it may be "many years" before the scheme is carried out, and much will depend on a revival of manufacturing prosperity.

The Lower Thames Valley Main Sewerage Board are defeated on their scheme for disposing of the local sewage by means of an irrigation farm at Molesey. The Local Government Board express their regret that in the discharge of their public duty they find themselves unable to grant the Provisional Order applied for. They recommend the Sewerage Board to consider the scheme of Sir Joseph Bazalgette for carrying the sewage into the West Kent system, so as to obtain an outfall in Long Reach, seven miles below the outfall of the Metropolitan Board. The Sewerage Board have resolved to "consider" the matter accordingly, taking another year for the purpose. The penalties for allowing the sewage to flow into the Thames in the district of the Sewerage Board are suspended until Michaelmas 1883, with the certainty that a further suspension will then be sought. The Local Government Board, in communicating their decision to the Sewerage Board, forwarded a copy of the report drawn up by their Inspector, Mr. J. T. Harrison. With respect to the objections urged by the Lambeth Water Company against the scheme, the Local Government Board say that "it is at least doubtful" whether the irrigation of the proposed farm with sewage would not affect the supply drawn from the subsoil by the Company. It is added that "the "Board would incur very grave responsibility if they sanc-"tioned a scheme which might prejudicially affect the water "supply of any part of the Metropolis."

A very powerful appeal to the Corporation of Norwich, with respect to the sanitary condition of that city, has been published in two recent issues of the *Norfolk News*. The disclosures are very properly described as both distressing and scandalous. Certain poor parts of the city have been visited by a member of the press, accompanied by a medical gentleman. Bad as some parts of London may be, the description given of the dwellings of the labouring class in Norwich is worse than anything with which we are acquainted in the Metropolis. The wretched state of repair in which many of the houses were found, is one remarkable feature. It seems as if some of these dwellings must very soon tumble down. Another extraordinary fact is the indifference displayed by the Sanitary Inspector, who either has too much to do, or has deliberately resolved to do nothing, perhaps believing this to be the best policy if he wishes to give satisfaction to his employers. There is a contract for the removal of house refuse, yet dust-bins are found in the most revolting and overloaded condition, and the people in many instances are compelled to throw their refuse on the street pavement. In one neighbourhood there are numerous wells, and into these the surface drainage often finds access, the water being fouled to a degree which must render it dangerously unwholesome. Yet there is an ample supply of excellent water close at hand in the Water Company's mains. The essential conditions of decency are cruelly violated, and the poor people complain that they cannot get any help or protection from the Authorities. It is evident that some of the houses in the city ought at once to be demolished, while others require structural alteration, and there is a general need of radical improvement. One way of effecting this healthful reform would be by applying the provisions of Mr. Torrens's Act. Among other arrangements requisite for the welfare of the people, the dust-bins should be regularly emptied at short intervals, the wells should be closed, and the water henceforth laid on from the mains. Some of the facts are said to be so grossly bad that they will not bear even to be hinted at, and we can only say that if the circumstances are at all as represented, the "sanitary arrangements" deserve the designation given to them of being "infamous." The presence of scarlet fever is no marvel under such conditions, as also a high death-rate. The people, we observe, appear to be better than their surroundings; but this will not long be the case, if they are left in such a state of physical degradation as our local contemporary describes. We cannot suppose that such a violation of sanitary laws will be allowed to continue, now that the facts are exposed by the public Press.

FRYER'S DESTRUCTOR AT LEEDS.—In reference to the paragraph in "Water and Sanitary Notes" of the 2nd inst., we are asked to state that the royalty paid to the patentee for the use of his apparatus at Leeds was £2150, not £150.

ECONOMICAL CARBONIZATION.

Mr. G. Livesey's recent communication on the question he therein propounded: "Is a high yield of gas per ton an infallible test of good management?" could receive, in the form in which it was put, but one answer. Good or economical management is not by any means assured to the Company who possess a good retort setter, aided by an equally good foreman stoker. When the Chairman of an important Company explained the absence of the Engineer from a Shareholders meeting by saying "he was in his right place, in the "retort-house," he displayed an imperfect acquaintance with the duties of that officer, and probably proved nothing more completely than that the addition of a fairly good director to the stoker and retort setter would yet leave much to be desired and to be provided before success would attend the operations of a Gas Company. A high yield of gas per ton may be obtained, as our correspondents generally have pointed out, at an excessive and disproportionate cost. The large quantity of gas may be of inferior quality for lighting purposes, and dangerously impure. The plant erected for its production may have been built and may be maintained at exorbitant cost; or the gas when made may be badly distributed, and the margin obtained beyond the ordinary standard thus wasted. The ways are many in which a man of "one idea" may bring trouble and loss in this particular direction, as in any other. This one item, then, as an "infallible" test, must be summarily dismissed, as would have to be any other standing similarly alone. At the same time a good manager will not be in any danger of slighting the importance of his retort-house work. Such a man, while he gives due and thoughtful attention to each of the other and numerous departments of his business, will be in no danger of overlooking this, and will, we think, usually find it a field yielding the most ample returns for the care he bestows upon its cultivation. Our correspondents have all confined themselves pretty closely to the limits set out by Mr. Livesey; that is to say, they have dealt only with a range, the lower extremity of which is above the reach of serious reproach. How much that limit might be depressed, and yet not go below the experience of many small and ill-designed works, many of our readers know well. In such cases as these the question is unencumbered with difficulties, and a greater yield is an indispensable condition of permanent success.

One fact is clearly, we may say luridly brought out by the present discussion, as it has been many times and in many ways before—*i.e.*, that gas engineers generally are richer in the possession of theories and beliefs than of facts and demonstrations. That the theories are often—indeed, usually well founded, there can be no doubt; but it is matter for real regret that on subjects capable of demonstration we are not better able to give a "reason for the faith that is in us." May we again direct the attention of the Committee of the British Association of Gas Managers to this matter, and repeat our suggestion that they have machinery easily at their disposal for obtaining and furnishing to their fellow-members much of that exact knowledge on this subject which is conspicuously needed. The difficulty of obtaining such information from the researches of individual experimenters is, we think, illustrated by the position taken by our esteemed contributor who opened this question of economical carbonizing, starting with a doubt as to the wisdom of a common practice. Mr. Livesey desires to see it definitely cleared away. He says: "It is "very desirable that some attempt should be made to "ascertain the economical maximum make of gas per ton, "and to this end the following *pros* and *cons* may be sug-"gestive, and lead to the necessary experiments that should "be undertaken to clear up the doubtful points;" and he concludes his article by promising that such experiments shall be put in hand, and the results, with his usual liberality, published, for comparison with those of other investigators, or for the benefit of those unable to conduct such inquiries for themselves. The correspondence has, however, confirmed the opinion originally held by Mr. Livesey, and his "last "word" on the question is, "Are any experiments really "required after this?" Now, when a busy man has satisfied himself on a matter, it is not unnatural that he should decline the labour of prolonged experiments needed simply to satisfy other people. The inquiry is, therefore, not an unnatural one, though we are happy in this case in our belief that it is only an inquiry, and not the statement of a conclusion. The inquiry is, for our purpose, sufficiently answered by the inquirer himself when he states: "It appears . . . "that the supposed advantage of a high make of gas per ton "of coal carbonized is not based on any actual experiments; "no one seems to know how much the illuminating power "is reduced by an increase of five per cent. in the volume of "gas made; or the difference in the tar, either as to quantity "or quality; or what extra amount of fuel is required; or "whether higher heats produce a gas containing more car-"bonic oxide and the troublesome sulphur compounds." If these questions and others of equal importance are capable—and the fact will hardly be disputed—of settlement once and for all by a series of careful experiments, those experiments ought to be made, however strong may be the convictions of the inquirers as to the results likely to be obtained. If the lines of such an inquiry were laid down by the Committee of the British Association of Gas Managers, we feel satisfied that no difficulty would be found in meeting with willing and competent men who would follow those lines, and so furnish the materials from which the definite conclusions desired could be obtained.

The figures used in this controversy are applicable especially to the product of but one coal-field—that from which London is, in the main, supplied. There are used in some places coals from which 9800 feet of gas would be an impossible maximum, while in parts of the Yorkshire field, for instance, 10,500 feet would be but an ordinary make. In the various coals sent to London from the Durham district there is a very considerable divergence in all the products, and it is therefore of first importance to the value of experiments such as are proposed that they should be made with the same sample of coal. All the deductions unfavourable to high makes per ton have been based upon the assumed necessity for using cannel to compensate for the diminished illuminating value of the gas produced. The necessity for this use of an increased quantity of cannel is, we think, by no means determined. Mr. Stevenson has found no such necessity, neither have the London Companies, with their largely increased make per ton, increased their percentage of cannel in anything like the direct ratio which some of our correspondents have calculated out. This is the very essence of the question, involving, as it does, the *method* of carbonizing throughout. Are we obtaining the economical maximum of light from the coal used? It is possible so to carbonize a coal capable, under proper treatment, of yielding 10,000 feet of sixteen-candle gas per ton, that only 8000 feet, and that of inferior quality, shall be obtained from it; and, of course, any degree between the two is equally possible. This all-important element, therefore, of the *necessary* cost of cannel remains to be determined by experiment.

The error of estimating the increased yield of gas at its selling price to the consumer has been pointed out frequently, but it has yet been twice introduced in the course of this correspondence. As in the case of diminished leakage, so with increased make, nothing is added to the rental, and consequently all the advantage is in the reduced consumption of coal, which must be estimated at its net cost. Saving on leakage has the advantage over increased yield, that the former may be estimated at its cost in the holder, while the latter must be taken in the retort-house only. The argument in favour of short and light, as against comparatively longer and heavier charges, is clearly an appropriate one, and would have something to do with the question of an increase or not in the percentage of cannel used.

We feel satisfied that the problem which has thus been re-stated will not be allowed to rest again without further practical efforts to solve it. In the meantime, it is clearly a mistake in these days to buy a coal for one of its constituents only, or in all places to put the first value on the same constituent. Improved makes should be aimed at rather by means of amendments in settings and apparatus than by heavier firing—working, in fact, still further in the same direction which in the last few years has led to such good results.

Mr. R. Smith, of Peterhead, has been appointed Gas Manager to the Heywood Local Board.

It is stated that, at to-day's meeting of the Commissioners of Sewers of the City of London—who have the lighting of the streets under their control—the Streets Committee will present a report on the reference to them of the tenders received for lighting certain parts of the City with electricity. The following recommendation will be submitted for adoption,—viz., to divide the area to be lighted into three districts, to be assigned: No. 1 to the Anglo-American Electric Light Company (Brush system), at a cost of £1410 for 12 months; No. 2 to the Electric and Magnetic Company (Jablochkoff system), at a cost of £2930 for 12 months; No. 3 to Messrs. Siemens Brothers, at a cost of £3720 for 12 months.

Purchase of the Bridgnorth Gas-Works by the Town Council.—At the meeting of the Bridgnorth Town Council on Thursday last—the Mayor in the chair—the Gas Committee reported that they had negotiated with the Directors of the Bridgnorth Gas Company, and offered to purchase the undertaking of the Company for £14,000, which had been accepted. The Committee recommended that £16,000 be borrowed for a term of 50 years, subject to the sanction of the Local Government Board. The report was agreed to.

GAS LEGISLATION FOR 1880.

(*Continued from p. 726.*)

LAST week we noticed six out of the eleven Acts of Parliament passed last sessions giving extended powers to provincial Gas Companies. The following refers to the remaining five:—

The *Maidstone Gas Act* is to empower the Maidstone Gas Company to construct additional works, to raise further capital, and for other purposes. The Company were first incorporated by an Act which was repealed by another Act of 1858, under which the Company have since carried on business. The capital authorized by the Act of 1858 consists of £12,500 in "A" shares, bearing ten per cent. dividend; £12,500 "B" shares, entitled to four per cent.; and new shares to the amount of £25,000, bearing seven and a half per cent. dividend; in all, £50,000 of ordinary share capital. The Company have also borrowed £10,000 on mortgage. The Act provides that as from June 30, 1880, the whole of the aforesaid capital is to be converted into Maidstone gas consolidated stock consisting of £51,785, bearing a seven per cent. dividend. Additional capital may be raised, under the auction clauses, to the amount of £50,000—not more than £40,000 to be issued the following year, or £10,000 in any subsequent year after the passing of the Act—to bear seven per cent. dividend. Power to borrow £12,500 is also given in respect of the new capital. The sliding scale is imposed with an initial price of 3s. 8d. per thousand feet. A one per cent. insurance-fund is permitted to be formed out of excess profits, and there is also included the usual sanction of a reserve-fund when the sliding scale operates to increase dividends. The Company take power to acquire certain lands for the purpose of their undertaking, and to supply or let on hire gas stoves, &c., and they may also supply gas in bulk. Shareholders are to have one vote for every £10 of stock or shares held. The gas is to be supplied at the usual pressure, and to be of fifteen-candle power; it is to be wholly free from sulphuretted hydrogen, and after the 1st of February next is not to contain, on an average of three days, more than twenty grains of sulphur in one hundred feet. A penalty of £5 attaches to any proved defect of purity or illuminating power. The Company may be represented by an officer on any occasion of the testing of the gas, but it is not necessary that notice of the time of any intended testing should be given them. The Corporation are to provide a testing-place at or near the Market Place, or in some other part of the borough of Maidstone to be agreed upon between themselves and the Company, or, in default of such agreement, to be fixed by the Board of Trade. The Company may, however, at their own expense, have a separate testing-place of their own in the same building. Meters used for measuring the supply of gas to public lamps shall be tested in the manner prescribed by the Sales of Gas Act, if their accuracy is disputed by the Company or any public authority, and if proved to register erroneously, are not to be used in computing gas supplied on the average meter system.

The *Prescot Gas Act* enlarges the powers of the Prescot Gas Company as regards capital and lands, and in other ways amends the Company's Act of 1867. By the old Act the Company were incorporated with a share capital of £9000, whereof £5000 were "A" shares, and £4000 were "B" shares, all paid up, and the Company were authorized to raise £2000 on loan. The Company are now empowered to issue additional "C" shares or stock to the value of £16,000, by auction or tender, dividend on which is limited to seven per cent. on ordinary, or six per cent. on preference capital. All classes of stock or shares will suffer alike in any insufficiency of profits. The Company may also borrow on mortgage in respect of the new capital not more than £4000. Section 35 of the Gas-Works Clauses Act, 1871, is abrogated in favour of the Company so far as to defer to March 25, 1882, the necessity of furnishing accounts to the Local Authority. Fifteen-candle gas is to be supplied, at a price fixed from time to time as follows:—If the total gas consumption of the preceding year shall have been under 9 million cubic feet, the maximum price is to be 5s. 10d. per thousand feet; if the consumption shall have been over 9 million, and under 11 million cubic feet, the maximum price is to be 5s. 7d. per thousand feet; and if the consumption shall have exceeded 11 million cubic feet, the maximum price is to be 5s. 4d. per thousand feet. Provided always that the Company shall allow a discount of ten per cent. on all quarterly payments made on demand or at the office of the Company within one month. The Company are to furnish the Local Board with a yearly statement, subject to audit, of the consumption of gas, except the same shall be admitted by the Company to exceed 11 million cubic feet. The Company take power to manufacture and store gas, and conduct the general business of their undertaking on lands described in the schedule to the Act. The usual clauses as to testing, pressure, interest on deposits, and other formal provisions, are included.

The *Reading Gas Act* enables the Reading Gas Company chiefly to raise additional capital and to construct new works. In 1862 the Reading Union Gas Company and the Reading Gaslight Company were amalgamated and incorporated into one Company, under the present name, with a capital of £40,000, and power to borrow £10,000. And again in 1870 an Act was passed to extend the Company's limits of supply, and enabling the Company to construct new works, and also to raise a further capital of £40,000, and to borrow £10,000 in respect thereof. With the exception of £14,000 in shares and £8000 to be borrowed, the Company have run through the powers thus conferred, and require to extend their works. The present Act empowers the Company to raise £80,000 by auction or tender, not more than £30,000 to be raised in the year following the passing of the Act, or more than £15,000 in any subsequent year. Dividend on the new capital is limited to seven per cent. ordinary, or six per cent. preference; all classes of shares or stock to bear proportionately any deficiency of dividend, and no back dividends on the new capital are to be paid beyond two years. Holders of the new shares or stock are entitled to all the rights and privileges appertaining to the Proprietors of any other classes of the Company's shares or stock. The Company have power to borrow £20,000 in respect of the new capital, and also to form a reserve-fund of £12,000. The Company are to supply fourteen-candle gas at the usual pressure, to be tested at the Corporation Buildings, at maximum prices varying within the borough from 4s. 3d. per thousand feet to consumers of less than 20,000 cubic feet half yearly, to 4s. per thousand to consumers of over 20,000 and under 40,000 cubic feet half yearly, and 3s. 9d. to consumers who take 40,000 cubic feet and upwards. Public lamps in the borough are to be charged after the rate of 3s. 5d. per thousand cubic feet. Consumers residing within a zone of one mile without the borough are subject to an increase of 1s. per thousand cubic feet on these proportional rates, and when residing beyond this zone to a further addition of 3d. per thousand cubic feet. Provided always that reductions in price within the borough are to be followed by corresponding reductions outside. Saving clauses are inserted in the Act for the protection of the Thames Conservators and the Urban Sanitary Authority. The Company take powers to acquire compulsorily certain lands within three years, and to erect additional works; and also obtain sanction for an agreement between the Company, Messrs. Huntley and Palmers, and the Corporation, respecting a certain right of way which the Company propose to extinguish, and to make a new road in place thereof.

The *Wandsworth and Putney Gas Act* authorizes the Wandsworth and Putney Gaslight and Coke Company to raise additional capital, and grants the Company other powers. By an Act of 1856 the Company were incorporated for the supply of gas to the parish of Wandsworth, and certain parts of the parishes of Battersea and Putney, with a capital of £30,000, half bearing ten per cent., and the other half seven and a half per cent. dividend; and by an Act of 1866 the Company obtained power to raise £40,000 additional capital at seven per cent., all which share capital has been raised and expended, and the Company moreover owe £16,000 on mortgage. The present Act authorizes the Company to raise by auction or tender £120,000, in addition to their old capital, at seven per cent. dividend. The new capital is to be issued by instalments of not exceeding £40,000 for the first year, and £15,000 in any subsequent year after the passing of the Act. The holders of new stock or shares are to have all the rights and the privileges of the existing Proprietors. Notice of any intended sale of shares is to be given to the Clerk of the Metropolitan Board of Works as well as to the London Stock Exchange. The Company take power to borrow £30,000 in respect of the additional capital. The sliding scale is imposed, with the initial price of 4s per thousand cubic feet. The usual provisions as to the formation of an insurance-fund and reserve-fund are inserted in the Act. The Company obtain power to take certain lands by agreement for the purposes of their undertaking, and also to erect on their own land dwelling-houses and cottages for their officers and servants. The illuminating power of the Company's gas and the manner of testing it remain as prescribed by their former Acts.

The *Yeadon and Guiseley Gas Act* confers further powers, chiefly with respect to capital, on the Yeadon and Guiseley Gaslight and Coke Company. The Company were re-incor-

porated by an Act of 1868, with a capital of £29,325 and £7300 borrowed, for the supply of gas to a certain district in the parishes of Guiseley and Otley, in the West Riding of Yorkshire. This new Act empowers them to raise £30,000 additional capital at seven per cent., under the auction clauses, at the rate of £10,000 for the first year, and £5000 in any subsequent year after the passing of the Act. All classes of shares and stock to bear proportionately any deficiency in dividend. Power is also given to the Company to borrow £7500 in respect of the new capital. An insurance-fund is to be formed with the usual proportion of any excess profits over the requirements for the maximum dividend, and any surplus remaining is to be carried to the credit of profit and loss. There is no special stipulation as to the price to be charged for gas. The Company take power to convert residuals, &c., on their existing lands, and also to make and let on hire or sell gas-fittings and stoves, and to hold licences under patents. The qualification of Directors elected after the passing of the Act is fixed at £100. The usual stipulation as to pressure is included in the Act.

(To be continued.)

THE SOUTH METROPOLITAN GAS-WORKS.

(Continued from p. 644.)

THE TANK AS FINISHED.

In the original design for this tank the wall was shown to be 5 ft. 6 in. thick at the bottom, gradually tapering to 3 feet thick at the top, thus necessitating the filling in of the space between the back of the wall and the face of the excavation, from the bottom to the top, with the fine sand. As it is impossible to make this backing as solid as the original undisturbed soil, it is advisable to have as little of it as possible, particularly in the case of a rendered tank, where the full pressure of the water is exerted upon the wall itself. The excavation of a tank is of necessity wider at the top, owing to the system of timbering with 9-inch deals, each successive frame of the deals or runners being placed within that next above it, the face of the second tier being 8 inches in front of the first, and so on. The excavation of the ring, therefore, consists of a series of steps, 8 inches wide, at intervals of 12 or 14 feet, according to the length of the runners, and as the wall is reduced in thickness as it rises, whilst the trench becomes wider, the amount of backing increases as the work approaches the ground line.

The soil for about 20 feet above the chalk consists of fine sand, which will stand vertical if the water is all drained out of it, but becomes running sand if the excavation is attempted whilst it remains saturated with water, which is its normal condition. Fortunately the contractors provided ample pumping power to thoroughly drain the ground in advance of their excavation; and, as a consequence, the sand stood firm at the back of the runners. Resting upon this fine sand is a thick bed of sharp sand and gravel, which was used for the concrete. This would not stand at all without support from the runners. Then came some loamy stuff; and on that the surface market-garden mould. Seeing that the lowermost bed of sand offered such a solid support to the concrete, it was thought advisable to dispense altogether with the artificial backing where the sand existed, and to fill in the concrete solidly against it. Hence the projections at the back of the wall, which, if unexplained, would appear so strange, there being two inverted sets-off, each 8 inches in depth, as shown in the drawing of the finished tank accompanying the present week's JOURNAL. The wall thus thickens in an upward direction to the top of the fine greensand, instead of diminishing in thickness as at first intended.

The original thickness at the bottom was to be 5 ft. 6 in., and the diameter of the tank 216 feet, for a 212-feet gasholder. But it was found that, with the sand so firm, and by building close up to it, it would be safe to reduce the thickness at the bottom to 4 ft. 6 in., thus increasing the diameter of the tank to 218 feet, and the gasholder to 214 feet. The depth has also been increased 6 inches, thus making the total depth 55 ft. 6 in., of which the rest-blocks, 72 in number, made entirely of concrete, take up 18 inches, giving a total working depth of 54 feet.

The sharp sand and gravel will not stand at a less angle than 1 to 1, which, in the original drawing, is the angle shown for the whole of the cone; but finding the greensand so firm, it was thought possible to reduce the amount of excavation, and the angle was accordingly altered to 6 inches to 1 foot for the lower part of the cone, thus effecting a double saving—viz., the cost of excavation and the trouble of disposing of the excavated material. The benching half way up the cone was consequently increased from a width of 4 feet to that shown in the second plan. The gravel and sand above this line was valuable, and as much of it as possible was taken out.

Fortunately the relations of the Company with the contractors were such that these considerable alterations could be made without any fear upon either side of a possible disagreement. Everything throughout the work has gone on smoothly and satisfactorily, and although, owing to the excessive rain last year, the amount of water in the ground was greater than was expected, the pumps were at all times fully masters of it. There were duplicate sets of pumps, three in a set, one set being 15 inches, and the other 18 inches in diameter; one set was kept in readiness to work if the other broke down in pumping for weeks together 1500 gallons a minute. The description of the timber framing for the crown of the gasholder will be given when the drawings representing it are published.

Notes.

[*This column is intended to contain miscellaneous memoranda on topics of general professional interest to our readers. We shall be glad to receive for insertion in it any scraps of information, observations of facts, or descriptions of apparatus, &c., which may be worth publication, and yet may not be considered suitable for our "Correspondence" column.*]

THE DETERMINATION OF NITROGEN IN COAL GAS.

Mr. G. S. T. Kennedy sends to the *American Gaslight Journal* an account of a very simple method devised by Dr. A. W. Wilkinson, Chemist to the New York Mutual Gaslight Company, for the estimation of the nitrogen in coal gas. The apparatus required consists essentially of a glass eudiometer tube of only one limb, divided into 100ths, open at the bottom, and having a stop-cock at the top, to which a funnel is also accurately fitted with a ground joint. The tube is held in a stand over a well cistern about 6 inches in diameter and 2 feet deep, filled with water. When ready for use, the tube is filled with water and the stop-cock closed. The funnel being removed, a connection is then made by a flexible tube from the top of the glass tube to the gas to be tested for nitrogen, and by opening the stop-cock 10 measures of the gas are drawn into the eudiometer. Oxygen of known purity is then introduced to the amount of 10 to 15 measures, and the tube is then carefully lowered into the well, a little water being run in by the funnel, with the object of causing a thorough mixture of the gases, and when this has been attained, and the tube finally submerged to the level of the gas contained, an electric spark is passed through it by the wires with which it is provided. After the explosion thus caused, which, although active, is not sufficiently violent to overcome the water-seal, the carbon and hydrogen compounds are found to have given place to carbonic acid and water, leaving an excess of oxygen and nitrogen unaltered. The carbonic acid is dissolved out by a solution of caustic potash, introduced by the funnel and allowed to run down the tube. This is followed by a solution of pyrogallate of potash, to absorb the oxygen, leaving the nitrogen. The observed volume of nitrogen multiplied by 10 gives the percentage in 100 measures of the coal gas examined. Care must be observed in the manipulation to avoid any admission of air to the tube, and it is also necessary to have ascertained the amount of nitrogen present in the oxygen used. When the oxygen is taken from a cylinder under pressure, as sold by manufacturing chemists, one determination of its percentage of nitrogen is sufficient for a series of analyses. The process described is simple, and requires but a few minutes for its completion.

WATERPROOFING MASONRY ARCHES.

Experiments have been made with various waterproof materials in common use as roof coverings, for the discovery of the best means of protecting from damp the land arches of the East River Bridge, at New York, which are to be used as stores and for general mercantile purposes. The severe climate of the locality, alternating between the extremities of heat and cold, and the strains to which a continuous coating is exposed when a constant and heavy traffic passes over it, rendered the selection of a suitable material unusually difficult, and in consequence several crucial tests were devised, to which were submitted the different materials offered in reply to a general invitation to tender for the work of waterproofing. A description of the tests and the materials experimented upon, with a statement of the results obtained, has been submitted by Mr. F. Collingwood to the American Society of Engineers. The method of testing is sufficiently ingenious in its bearing on the conditions to which waterproof roofings and road coverings are subject in ordinary use. Wooden moulds were prepared with grooves about 2 feet long, with enlargements at each end, similar to the form of cement briquettes, or metal plates as usually prepared for tests of tensile strength, and the grooves were filled with the material under examination. These, with some flat pieces of the material, were exposed to a freezing mixture for 48 hours. If the specimens endured the cold test without sign of fracture, the plates were first tested with a loaded point, for susceptibility to penetration, and were then dropped through a short distance to see if they would break. In this way an idea was obtained of the relative hardness and brittleness, as well as of the contraction under cold, by careful measurement, of the specimens. After this they were heated, and their behaviour at a high temperature was noted. Next, two forms of durability tests were imposed, resting on the assumption that in time destruction would be caused either by the gradual evaporation of the volatile constituents of the mixture which originally gave it plasticity, and thus causing it to become crumbly and absorbent (this was tried by very carefully weighing a sample before and after its exposure in a sand bath to a temperature of 212° Fahr. for 48 hours, and noting the percentage of loss); or disintegration might be due to the absorption of water, and its consequent freezing and thawing. To determine this question, carefully-weighed samples were soaked in water for 48 hours, then wiped, and the increase of weight observed. The materials tested comprised coal tar and felt; coal tar mixed with Trinidad bitumen and sand; asphaltic mastics composed of Val de Travers and Limmer asphaltes, Trinidad bitumen, residuum oil, limestone, &c.; Trinidad bitumen mixed with 10 per cent. of residuum oil; and other compounds of the same substances, together with a mixture of soapstone, crude petroleum, and resin. The samples containing coal tar were all rejected, apparently because of their failure to stand the dry-heat test for evaporation, and eventually preference was given to the mixture of refined Trinidad bitumen and 10 per cent. of residuum oil, and Mr. Collingwood stated his belief that the

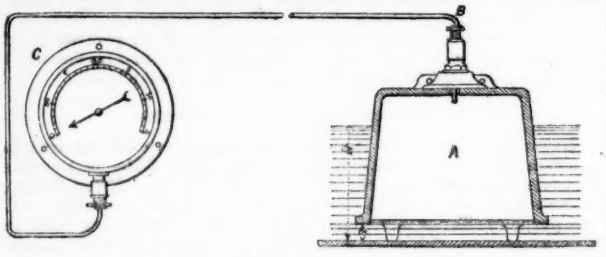
bitumen would really be best without any admixture of oil, for many purposes. It does not appear that coal tar pitch, specially prepared, entered into the competition, or a somewhat different choice might have been made.

A Cheap Oil Bath for the Laboratory.

At the recent meeting of the South-West of England District Association of Gas Managers, Mr. N. H. Humphrys exhibited a simple and cheaply-constructed oil bath, for drying small quantities of lime, oxide, &c., and which may also be used for determining quantitatively the percentage of moisture. It was specially contrived by him for ascertaining the quantity of water contained in lime prepared for purifiers. The apparatus consists of an ordinary cylindrical tin canister, in the lid of which two or more round holes are cut, of a diameter sufficient to admit the insertion of a test-tube in each hole; a smaller hole is also provided for inserting a tube thermometer. The substances to be dried are placed in the test-tubes, and the canister being filled with oil to within an inch or so of the top, is heated over a very small Bunsen burner; or an Argand burner turned very low, without chimney, will be found sufficient for the purpose, and it can be delicately regulated. The temperature to which the substances in the tube are exposed may be ascertained by the thermometer, and regulated as required. They may be kept at a little over 212° Fahr., or increased up to 400° or 500°—nearly the decomposing heat of the oil. For the quantitative determination of the water in a sample of lime, a given quantity (say, 50 grains) may be placed in one of the test-tubes. The weight of the tube being taken, the 50 grains may be placed in it, and the weight again taken, to guard against loss in transferring it into the tube. The tube is then placed in the canister, and submitted to a temperature of 300° for an hour or more; it may then be taken out, carefully wiped, and weighed, when the loss of weight as compared with the first weighing will indicate the quantity of water.

A New Water-Line Indicator.

A paper by M. Leclerc on M. Decaudun's water-line indicator, presented to the Société Technique de l'Industrie du Gaz en France at their last congress, describes with much fulness of detail this neat apparatus, which is said to act with remarkable efficiency. The



arrangement, as will be seen by the accompanying figure, taken from the *Journal des Usines à Gaz*, consists of a bell, A, placed at the bottom of the reservoir containing the liquid, the height of which is to be measured, a space, *a*, being left between the bottom of the bell and the tank, to permit of free access of the liquid to the interior of the former. A tube, B, connects the interior of the bell with the gauge, C. The action of the apparatus is simply pneumatic in principle. The bell and tube being maintained full of air, any alteration in the height, H, of the liquid in the reservoir exerts a corresponding effect upon the degree of compression of the confined air, and this in turn operates on the gauge, which is constructed in accordance with the amount of variation to be shown in every case. When great delicacy is required in order to show slight differences of level, say of the liquid in a hydraulic main, a kind of King's gauge, or a simple water-gauge, is suitable; or for the measurement of water-tanks, tar or liquor wells, &c., a gauge on the principle of the aneroid barometer is adopted. As nothing but air enters the bell and tube, the density or possible foulness of the liquid in which they are immersed does not affect the action of the gauge, which may be at any distance from the remainder of the apparatus, and may also be graduated to interpret the action of the air pressure by which it is actuated, either in terms of the height of the liquid or of the contents of the reservoir. The bell is not usually fixed to the tank, but rests in it by its own weight. The connecting tube is generally of copper, of only 3 millimètres diameter, and is therefore susceptible of being easily laid where required, to actuate one or more gauges. The arrangement may be modified to serve the purpose of an indicator of the height or contents of gasholders, by fixing the bell to the bottom curb of the holder. The diminution of pressure as the curb approaches the surface of the water would then be shown by the gauge, and the latter might be fitted with an alarum, to call attention to the state of the holder before it could begin to blow.

Siemens's Regenerator Gas-Lamps.

A recent number of the *Journal des Usines à Gaz* contains a brief notice of the Siemens regenerative gas-lamps, of which we gave a description in the Journal, Vol. XXXV, No. 870. These lamps are constructed upon the principle of heating the air required for the combustion of the gas, and also, in a minor degree, the gas itself by the waste heat of the products of combustion. The utility of this proceeding has been much questioned, but our contemporary states that in the Siemens arrangement it gives very satisfactory results. The particular lamp referred to in the present instance gave a light equal to that of about 20 carcel lamps, or 190 candles, with a consumption of 800 litres, or 28·25 cubic feet of gas per hour—equivalent to 40 litres per carcel lamp, or to an illuminating power of 33·6 candles per 5 cubic feet. The illuminating power of the gas as usually estimated is not given, nor is the pattern of the Siemens lamp indicated. The duty thus stated as having been yielded by the regenerative lamp is about double that of the powerful Argands of the "Phare" type, or of M. Bengel's spheroidal burner.

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

THE ECONOMY OF CARBONIZATION.

Sir,—I hope Mr. G. Ernest Stevenson will excuse me for pointing out one or two little errors in his otherwise well-written article in the last number of the Journal.

95 tons 5 cwt. of coal, at 14s., not £66 10s., but .			£66 13 6
18 cwt. of coke per furnace, in 22 settings (not six) . . .	19 tons 16 cwt.		
Coke for sale, 42 tons 2 cwt. (not 42 tons 12 cwt.), at 12s. . . .	£25 5 2		
950 gallons of tar	7 18 0		
2250 gallons of liquor, at 60s., not £6 16s., but	6 15 0		
			39 18 2
Net cost of coal			£26 15 4
With 10,500 feet to the ton, against 10,000 feet, costing			27 16 0
Difference only			£1 0 8

I cannot, however, admit that by carbonizing 4¾ per cent. less coals the labour is to be reduced nearly 17 per cent. I doubt if there would be any reduction, for high heats and four-hour charges, if the rule and not the exception, would lead to three shifts of stokers in the course of 24 hours.

The increase from 16 cwt. to 18 cwt. of fuel per furnace is not enough; an increase of 25 per cent. instead of 12½ would be nearer the mark. Thus:

	Tons. Cwt.			
95 tons 5 cwt. of coal				£66 13 6
Coke produced	61 18			
Less fuel used	22 0			
Say 40 tons for sale, at 12s. . . .		£24	0 0	
950 gallons of tar		7	18 0	
2250 gallons of liquor		6	15 0	
				38 13 0
Net cost of coal				£28 0 6
Labour—deduct 5 per cent. off £7 4s.				6 16 9
				£34 17 3

Showing a slight difference of 0·033d. per 1000 feet in favour of the 10,500 feet of gas, which may be more than swept away by increased wear and tear.

In these calculations it must be borne in mind that it is assumed the extra 500 feet of gas per ton of coals is not reducing the illuminating power of the gas below the requirements of the district supplied.

Mr. Stevenson corrects Mr. Livesey under the head of interest on plant. I have to correct Mr. Stevenson thus far: Capital is now almost universally raised by gas companies at from 5 to 6 per cent., instead of, as calculated by Mr. Stevenson, at 10 per cent. However, even at 5 per cent., the interest on saving of capital, at £50 per retort (which includes the retort-house and connections), amounts to one-eighth of a penny per 1000 feet in favour of the 10,500 feet of gas.

Where a gas company has only a small margin of retorts in excess of actual requirements, high heats will pay, and will stave off the increase of *dead* capital, which, in a moderate-sized works of, say, 50 to 200 millions, always arises with an extension, such as building a new retort-house. If we could limit our increase of capital to £50 for each additional retort wanted for increased business, we should avoid dead or unproductive capital in the retort-house; but this cannot be done.

Nov. 11, 1880. R. H. Jones.

THE LIGHTING OF THE QUEEN STREET STATION, GLASGOW.

Sir,—Referring to the remarks of your Glasgow correspondent, in the last number of the Journal, with respect to the lighting of the new station of the North British Railway in Glasgow, permit us to confirm his statement that the lamps were "actually ordered from the Leeds firm" six weeks ago, and to add that they are now being rapidly supplied by us.

Perhaps the most interesting feature connected with the two systems of lighting being thus placed in competition is the opportunity it affords for the electric light being tested as to cost and utility in comparison with gas lanterns of improved construction for lighting railway stations. No doubt the results will be awaited with interest.

Leeds, Nov. 13, 1880. G. Bray and Co.

THE AITKEN AND YOUNG ANALYZER.

Sir,—In "Notes from Scotland" by your Edinburgh correspondent, as appearing in the Journal of the 9th inst., some strong remarks are made as to the want of appreciation of the Aitken and Young Analyzer by those connected with the gas interest in Scotland; but to many it appears very strange that, after the issuing of such a favourable report by a Committee of the West of Scotland Association of Gas Managers, no sound has been heard of its success, nor any paper, so far as I know, has been read at any of our late meetings giving the results of its use at any gas-works in Scotland. What is wanted is more infor-

mation as to its utility in actual working, before committing ourselves to the great expense of the erection of the necessary machinery.

If either of your Scotch correspondents can give any information where one in actual operation can be seen; or state positively if Mr. Stewart, of Greenock, or any member of the Committee who met at Hamilton and issued forth so flaming a report, which has evidently set on fire the imagination of your correspondents, has had the analyzer fitted up in his works, a favour will be conferred on

Nov. 12, 1880. AN OLD SUBSCRIBER.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

THURSDAY, NOV. 11.

(*Before the* MASTER OF THE ROLLS.)

In re THE SHEFFIELD WATER-WORKS COMPANY *v.* BINGHAM.

This action involved the question whether the Sheffield Water-Works Company are entitled, under their Act of Parliament, to make a special charge for water supplied by them to fixed baths in private dwelling-houses. The Company were incorporated by an Act of Geo. IV., the provisions of which were repeated in the Sheffield Water-Works Act of 1853. The 79th section of the Act requires the Company to furnish a sufficient supply of water to every inhabitant occupying a private dwelling-house or part of a dwelling-house in any square, street, close, or lane of the town and borough of Sheffield, and in any other place within the limits of the Act where the pipes of the Company were then or might thereafter be laid, for the use of his or her family, at the following rates—viz., where the rent of the dwelling-house does not exceed £7 per annum, at a rate of 6 per cent. per annum on the rent, but not in any case to exceed 7s. 2d. a year; and where the rent amounts to £7, but does not exceed £8, a rate not exceeding 8s. a year. The maximum charge for houses rented between £8 and £10 is 10s. per annum; between £10 and £12, 12s. per annum; between £12 and £15, 14s.; between £15 and £18, 16s.; between £18 and £20, 18s.; between £20 and £25, £1; between £25 and £30, £1 5s.; between £30 and £35, £1 10s.; between £35 and £40, £1 15s.; between £40 and £50, £2; between £50 and £60, £2 5s.; between £60 and £70, £2 10s.; between £70 and £80, £2 15s.; between £80 and £100, £3; and from £100 and upwards the rate progresses in like proportion—with the proviso that the Company shall not be entitled to receive from any inhabitant more than the sum of £6 in any one year, nor be obliged to furnish a supply to any inhabitant for less than 7s. 2d. a year. By section 8, it is provided that in the case of schools, manufactories, dyers, printers, bleachers, brewers, innkeepers, livery-stable keepers, and other persons requiring a supply of water for other purposes than domestic consumption, or persons requiring a supply for baths, ponds, pools, or closets, or for the purposes of any trade or business whatsoever, such supply shall be furnished at the following rate, viz.:—A rate not exceeding 10d. for every 1000 gallons supplied up to 500,000 gallons per annum, and where the quantity exceeds 500,000 gallons, but does not exceed 1,000,000 gallons, the rate is not to exceed 9d. for every 1000 gallons of the excess beyond 500,000 gallons. When the supply exceeds 1,000,000 gallons, but is less than 1,500,000 gallons, then the rate is not to exceed 8d. for every 1000 gallons of the excess beyond 1,000,000 gallons. Where the supply is between 1,500,000 and 2,000,000 gallons a year, the rate is not to exceed 7d. for every 1000 gallons of excess beyond 1,500,000 gallons; and where the quantity exceeds 2,000,000 gallons the maximum charge is fixed at 6d. for every 1000 gallons of the excess. A proviso attached to the clause enacts that in the case of stables, or premises in which horses are kept, attached to or occupied with any private dwelling-house, the water-rate shall, if desired by the occupier, be assessed upon the amount of rent of the dwelling-house, including the rent of the stables or premises. The 82nd section provides that the Company shall not charge more for any one year than the several rates specified in respect of water-closets belonging to any private dwelling-house, these rates being 4s. when the annual rack-rent does not exceed £10 per annum, 5s. for one and 4s. for any other when the rent is between £10 and £25; and 6s. for one when the rent is between £25 and £50, and the charge of 4s. for each additional closet being continued through the ascending scale. The rate for the first is to be 7s. 6d. upon a rental of between £50 and £100, and 10s. for a rental above £100, provided that where a water-closet is used in common by the occupiers of more than one private dwelling-house, the annual rack-rent on which the charge is to be calculated is to be the aggregate rent of all such houses. In 1864 an Act of Parliament was passed which authorized the Company to increase the rate by 25 per cent. for 25 years. The Company, according to their statement of claim, considering that the use of the water for every private bath would be troublesome and expensive to the consumers, drew up a scale of composition rates, varying with the rent of the house; but to the scale they annexed a note, stating that the baths could be supplied by meter if the owners so desired. By this scale the payment required for a house rated at £100 a year and upwards is for one bath £1 10s. per annum. Mr. Bingham, the defendant, occupies a house at Ranmoor Park, a suburb of Sheffield, rented at £140 per annum, and within the limits of the district over which the plaintiffs powers extended, and he has for several years been supplied with water by them. Up to the 24th of June, 1878, the defendant paid for the water he used for his bath at the composition rate of £1 10s. per annum, in addition to the sum of £5 5s. payable in pursuance of the 79th section of the Act of 1853, for the water supply to his house—being £3 on the rent, *plus* the 25 per cent. added by the authority of the Company's Act of 1864. Since the 24th of June, 1878, the defendant had positively refused to pay anything in respect of the water used in his bath. On the 12th of November, 1879, the plaintiffs wrote for payment of £1 17s. 6d. for the water used in the bath since June, 1878, and requested defendant to pay for it thereafter either at the composition rate of £1 10s. per annum or according to the quantity used. The defendant, however, persisted in his refusal to pay anything in respect of the bath supply, and the Company accordingly brought this action to establish their title to make the charge. The defendant contended that according to the proper construction of the Water-Works Clauses Act of 1847, and the Sheffield Water-Works Act of 1853, he was entitled to use the water for the bath as part of the domestic supply, and, therefore, without additional payment. The plaintiffs claimed on account of the quantity of water supplied by them, and used in or by means of the bath, from the 24th of June, 1878, till the trial of the action, and asked that the defendant might be ordered to pay for it either at the composition rate paid by him up to the 24th of June, 1878, or at the statutory rate prescribed by their Act of 1853. A declaration was prayed that the defendant was liable to pay for all water supplied by the plaintiffs and used by the defendant in his bath, and an injunction was also sought to restrain the defendant from keeping the bath connected with the water-pipes in such a manner as to be able to divert water from such pipes to his bath, and from in any manner drawing the water supplied to the defendant or using it in his bath except upon the terms of his paying for it in the manner provided, or except through a proper meter to be fixed by the plaintiffs. By the statement of defence defendant pointed out that the Company's special Act of 1853 had not provided, in the case of baths in private dwelling-houses, any rate for payment, and argued, therefore, that it was the obvious intention of the Legislature that no extra payment was to be made for the purpose. If extra payment for baths in private dwelling-houses had been intended, a rate for payment would, he argued, have been found in the special Act, and provision would have been made for the expense of putting up meters to measure the supply. It was because the Company could not reasonably either bear themselves or impose on their customers the expense of meters for baths that they devised their scale of composition rates, and no payments had been made to them for private baths except on the composition scale. He denied ever having seen the composition scale, which he alleged was arbitrarily fixed by the plaintiffs, and was excessive. His bath was filled and emptied by pipes attached to it, and it was used for domestic purposes only. In private houses in Sheffield where baths were filled and emptied without the agency of pipes, no charge was made by the plaintiffs, nor did they charge for water used in basins and emptied through pipes connected with the plaintiffs system. The defendant resisted payment on the ground that the plaintiffs were not entitled, under the Acts referred to, to charge for the water used in the bath, and he declared that he defended this action on public grounds, and for the purpose of getting a legal decision on the question raised.

Mr. BAGSHAWE, Q.C., and Mr. B. B. ROGERS appeared for the plaintiffs; Mr. CHITTY, Q.C., and Mr. BUCKLEY for the defendant.

Mr. BAGSHAWE, in opening the case, said the action was brought to raise the question, and all parties were desirous to have the decision of the Court on the effect of the Company's Act as to the right it gave them to charge extra for baths, &c. It turned upon two sections of the Act of 1853. He then detailed the sections, as given above.

The MASTER of the ROLLS asked whether the question was as to whether the Company could charge for a bath in a private house.

Mr. BAGSHAWE: Yes; a fixed bath in a private house.

The MASTER of the ROLLS asked how they were to find out whether a man had a fixed or an unfixed bath.

Mr. BAGSHAWE said there was no question about that. As a matter of fact it was quite obvious that when a bath was not fixed, but was filled by hand, it was not to be charged.

The MASTER of the ROLLS: A man has a bath, and when he wants to use it he puts on a piece of india-rubber hose to supply water to it.

Mr. BAGSHAWE said he had no right to attach a hose. There was a clause in the Act against that. The Company here claimed in respect of a regular bath.

Mr. CHITTY: But you do not claim for a fixed basin.

Mr. BAGSHAWE: A fixed bath is not a fixed basin.

The MASTER of the ROLLS: How do you find out how much water is supplied?

Mr. BAGSHAWE: By means of our parliamentary powers to attach meters. We have meters which determine the supply of water. Wherever there is a right to charge for water there is also in the Act a power to enter, and so forth.

The MASTER of the ROLLS: Do you mean to say that you have a right to charge for water-closets?

Mr. BAGSHAWE said he did, and he was going to apply that test. Their Act authorized the Company to make additional charges. His lordship would understand that his friend would have to find something to qualify the words about baths, but he should ask his lordship to take the words as they stood.

The MASTER of the ROLLS: Do you charge for water-closets really?

Mr. BAGSHAWE said the Company did; but there was a maximum imposed by section 82, which assumed that they were entitled to charge for water-closets beyond the charge for domestic purposes. It stood thus, that the Company would, under section 79, be bound to supply a closet, and horses and carriages. Section 81 gave them the power to charge extra for baths, carriages, business, trade, and other things. Then the proviso at the end of section 81 took in stables, and premises attached to or occupied with any part of a house. The rate was to be assessed on the amount of the rent of a private dwelling-house. That seemed to be conclusive. There was an authorized charge for horses and carriages attached to a private dwelling-house.

The MASTER of the ROLLS: The first section says the Company shall not take any more than a certain sum, and the next says they shall be entitled to charge; it does not say an additional charge.

Mr. BAGSHAWE said, first, the water supplied was for domestic purposes generally; then for certain specified purposes there was an additional charge. This was plain, else what was the additional charge for? It was not to be found anywhere except in the one section.

The MASTER of the ROLLS: You have a power to supply by meter.

Mr. BAGSHAWE said they had. It was quite clear under this section that the Company might make an additional charge for water required for horses and carriages. He took it that, if he had a right to charge by quantity, and had no power to put a meter in, the quantity would have to be ascertained as best it could.

The MASTER of the ROLLS inquired if the Company were incorporated.

Mr. CHITTY: Yes, by the Act of 1853.

Mr. BAGSHAWE said he would quote section 12—where the undertakers were authorized by the previous Act to supply water for other than domestic purposes, they should not be liable in certain cases. There was a reference to water being required for fountains or ornamental purposes, which meant that a supply of water for domestic purposes was really a supply of water for horses and carriages. It had been decided that the supply of water for a private carriage would be included under the charge he was entitled to make. It was plain, therefore, that section 81 dealt with matters that would be included in section 79, and they had a right to charge an additional rate. His friend's argument seemed to be that because the bath was in his house he would be liable to be charged a higher rent.

The MASTER of the ROLLS said a bath was a moveable fixture, and he did not see that a higher rent could be charged. If Mr. Chitty alleged that he was charged a higher rent he must show that the mere fitting up of a room as a bath-room without pipes for a bath increased the rent.

Mr. BAGSHAWE said if it were so fitted the room would be withdrawn from ordinary use.

The MASTER of the ROLLS said he should very much doubt whether it would add to the letting value of a house.

Mr. CHITTY said his friend was moving upon the pleadings.

The MASTER of the ROLLS said he was. The simple question was, as he understood, had the Company a right to charge extra for baths? This was the contention. He would call upon Mr. Chitty, for the defendant, to address him.

Mr. CHITTY said by the 79th section of their Act the Company were bound to furnish a sufficient supply of water for the use of a family.

The MASTER of the ROLLS: It is clear that whatever is in the 81st section is additional to that in the 79th.

Mr. CHITTY said the scope of the 81st section referred to the supply of

water for other than domestic purposes. The marginal note to the Act was, "for the supply of water for other than domestic purposes."

The MASTER of the ROLLS: It very often happens that changes take place, and the sections are amended, but the marginal note is overlooked altogether, and remains without alteration.

Mr. CHITTY contended that it was clear that section 79 entitled the defendant to a supply of water for his bath, whether moveable or fixed. The words of the Act upon which he should rely were, "for the use of his or her family," and there was in the Act a requisition on the Company to supply water to every inhabitant sufficient for his or her use. The inhabitants were therefore entitled to have a supply sufficient for the use of their own houses, which would include a bath.

The MASTER of the ROLLS: I do not know how you can make out what quantity is sufficient for the use of a family. It appears to me that the Act is very imperfectly drawn, because if it is confined to the use of "his or her family," then it would exclude the supply necessary for any visitors. Then, again, supposing a man keeps lodgers, is he to be prevented from supplying them with water because they are not members of his family? The language of the Act is very imperfect, and it would be impossible to argue upon the literal meaning of the words in that way. Whatever could be charged under section 79 could be charged under section 81, and the point is what that section really means.

Mr. CHITTY said the Act was not very correctly framed, or he would not be before his lordship. Section 79 commenced with a clear obligation on the Company to furnish a supply of water for domestic purposes, and then section 81 said such a supply should be furnished by the Company to schools, dyers, and so on, after certain rates. That applied, of course, to tradesmen who, in the course of their business, used an enormous quantity of water.

The MASTER of the ROLLS: The Company have the monopoly, and of course they are bound to supply all the inhabitants, whether tradesmen or not. It would be monstrous if they were not bound to do so.

Mr. CHITTY said that where there was a supply for domestic use it was to be paid for in the shape of a rental, and not at so much per gallon.

The MASTER of the ROLLS: Take the case of a school. Has the schoolmaster to pay twice over for his water supply, once in the shape of rental, and again at so much per gallon? What is the practice of the Company, Mr. Bagshawe, with reference to schools, manufactories, dye-houses, and so on?

Mr. BAGSHAWE: We supply them by meter.

The MASTER of the ROLLS: Do you mean to say that in the case of persons requiring a supply of water for other than domestic purposes—take the case of a distiller—you would charge him rent as well as per meter?

Mr. BAGSHAWE: If he had a private dwelling-house in connection with his place of business he would be charged accordingly, but in respect of the supply of water required for his business, the scheme of the Act seems to be that the scale of charges is to be on a different footing.

The MASTER of the ROLLS: It appears to me perfectly plain that section 82 is what we call a cutting-down clause on 81. The Company are not to charge any more than they were previously empowered to do. They cannot charge anything if the occupier does not use 1000 gallons, and surely there may be water-closets which do not require so much. As Mr. Chitty has pointed out, if the thing were plain he would not be here at all. Until quite recent times a bath was considered a great luxury in a house—in fact, so recently as 20 years ago houses of very considerable value in London were built without bath-rooms.

Mr. CHITTY said he contended that the defendant paid on the additional rental in respect of the private bath-room, because the value of the house was increased thereby.

The MASTER of the ROLLS: If you use a bath it appears to me you are within the section.

Mr. CHITTY said it might be a large bath, not fixed but moveable.

The MASTER of the ROLLS: You cannot avoid payment because the bath is not a fixture.

Mr. CHITTY said the plaintiffs wanted to construe the word "bath" in the widest sense, but he contended it was not to include a bath used for domestic purposes in a private dwelling-house. By the 12th section of the Act of 1853 it was provided that payment should be made for water used for horses and carriages in connection with private houses, but this was on the rental of the stables. What his friend's contention amounted to was this—that the defendant was to pay twice over, once by the gallon and again on the increased value of his house.

Mr. BUCKLEY said the 81st section began by specifying schools, manufactories, and so on requiring water for other than domestic purposes, and who were not within section 79, which only dealt with the inhabitants of private dwelling-houses.

The MASTER of the ROLLS, in giving his decision, said: I see no reason for departing from my rule of construing the words of an Act of Parliament according to their plainest apparent meaning. There is no context here to cut down the force of the words used, and I therefore give them their full meaning, without troubling myself to go into the questions of difficulty which have been suggested at the bar. Almost every enactment of this kind, if we trace it out to its ultimate consequences, may be found now and then, in particular cases not contemplated by its framers, to lead to difficult and even absurd conclusions. But the fact that there are possible cases which, look absurd is no reason why we should not give the proper meaning to the terms of the section. Section 79, as I read it, requires the Company to furnish a sufficient supply of water, for every inhabitant, for what I may call ordinary domestic purposes. These are not the words of the section. The section is not at all well worded, but that is what I understand it to mean. The wording is very peculiar, for the section requires the Company to supply every inhabitant—not every house, as one would think it should be—with water for the use of his or her family. Well, I am satisfied that the word "family" must have a very large meaning, including the household, and though the section says every inhabitant, the meaning must be the supply of water to the house, and I should have held, if there had been no other section, that the words covered all ordinary domestic purposes, including, therefore, the use of water for a bath or water-closet. Then there is section 81, which, as I read it, entitles the Company to charge, over and above the rate imposed in section 79, for certain things, and it entitles them to charge, in substitution of the charges provided by section 79, for certain other things. I have rather inverted the order. As I understand it, the case of the first class includes schools, manufactories, dyers, printers, bleachers, brewers, innkeepers, livery-stable keepers, alehouse keepers, and other persons requiring a supply of water for other purposes than for their own family's consumption, and these persons are to be charged according to the supply, and are not to pay according to the rates fixed by section 79. Then we come to other persons—"all persons requiring a supply of water for baths, ponds or pools, or closets, or for washing carriages, or for cows or horses, or for the purposes of any trade or business whatsoever." These are "other people," and obviously, by the very words, must include private persons, because it is not requiring a supply of water for baths for the purpose of a trade or business, but it distinguishes between domestic purposes and the purposes of trade and business. Consequently, it appears to me that the first words are obviously applicable to persons who do not carry on any trade or business. Well, that being so, is there any difficulty about the words "baths, ponds or pools, or closets?" Let us see what it is. Bath is a well-known term, and the meaning of "pond" is well known. By "pool" evidently is meant cesspool as distinguished from a pond, and the supply of water to a closet can only refer to a water-closet. If this is so, then the Company are by their Act entitled to charge a rate not exceeding 10d. for every 1000 gallons so supplied, that is for those particular purposes. I see no difficulty about this. Then there is a proviso which, if wanted at all, would make the purpose clear, though I do not think it is wanted at all. But it is plain that in the case of stables or premises in which horses or carriages are kept, attached to and occupied with any private dwelling-house, the water-rate shall, if desired by the occupier, be assessed upon the amount of rent of the private dwelling-house, including the rent of such stables or premises; and the Company shall not in such case be authorized to make the additional charges authorized in respect to the supply of water for such horses and carriages. So here it is plain that a man who does not carry on a trade or business is intended by section 81 to pay, but subject to this, that if the stables are attached to and occupied as a private dwelling-house, then he at his option may require them to make him pay on the rent, and not according to the supply, but if he does not exercise the option, he is to pay as on a private dwelling-house. Therefore there does not appear to me to be any real difficulty in seeing that it is intended that the supply to a bath, cesspool, or water-closet was to be paid for separately. There is yet another section which confirms this view, if it needed confirmation. The 82nd section provides that the Company shall not charge more to any one than the several rates that are specified in regard to water-closets in or belonging to any private dwellings. This shows two things—first of all, that they are entitled to make some charge in respect of water-closets; and secondly, that they are entitled to make that charge by some other section, and it is provided that they are not to charge more. The only section which mentions closets is the 81st, and the result is that they have power to charge per 1000 gallons under the 81st section, and the maximum of charge is regulated by the 82nd section; but as I understand, if they supply less than 1000 gallons a year they are not entitled to charge at all under section 82. Therefore it comes to this, that they can charge extra in respect of water-closets in private dwelling-houses, but not more extra than the amount specified in the 82nd section. This being so, there is no greater difficulty in ascertaining the quantity of water supplied to a bath than the quantity supplied to a water-closet or cesspool. At this time there is no mode of measuring it but by putting a separate meter for each house, though such authority has been given by the Act of Parliament. But the Act does not say that the water shall be measured. You can prove the quantity used without measurement—you can show that a bath contains so much water, and that it is used on the average so many times in a year—with sufficient accuracy to get damages from a jury based on such calculation. There are many problems which are more difficult than this. The same observation applies to cesspools and water-closets. If such evidence can be given of the quantity used for such purpose, it is quite satisfactory to show what the maximum charge should be. The measurement is not very fine, and when you take 1000 gallons as the unit, a few gallons either way will not make much difference. Considering what the unit is and the use made of the water, there is no great difficulty in ascertaining the quantity with sufficient accuracy for the purpose of the rate. It appears to me the Company are reasonably entitled to make a charge, under the authority of the 81st section, upon private dwelling-houses for water supplied to baths.

Mr. BAGSHAWE: Then I will ask for a declaration in the terms of the third section of the prayer. Of course the defendant has the alternative either to pay according to measured quantity or at the composition rate of £1 10s. a year on his rental.

The MASTER of the ROLLS: He is liable to pay for what water is supplied to his bath in excess of 1000 gallons a year.

Mr. BAGSHAWE: He cannot surely want to have it proved by evidence that there is an excess.

The MASTER of the ROLLS: He is entitled to an inquiry if he wishes it.

Mr. CHITTY: Mr. Bingham's is a representative case, and he may desire to carry it elsewhere.

The MASTER of the ROLLS: I should be glad indeed if he would.

Mr. BAGSHAWE asked for costs, as he understood that the defendant had £1000 at his call.

The MASTER of the ROLLS said the plaintiffs were entitled to costs.

Mr. CHITTY observed that there was nothing in the statement of claim about excess over 1000 gallons.

Mr. BAGSHAWE pointed out that by the defence the plaintiff admitted that if his bath supply was chargeable at all under the Act, he was liable to make some payment; but he represented that the payment demanded was largely in excess of what he would have to pay under section 81.

Mr. CHITTY did not think it would be worth while to go into an inquiry as to the quantity used.

The MASTER of the ROLLS, as the arrears only amounted to £3, fully endorsed this view.

Mr. CHITTY said he was brought there simply upon the pleadings, and there was nothing in them about the 1000 gallons.

Mr. BAGSHAWE admitted this, but asked, as an appeal was threatened, that the plaintiffs might have liberty to amend their statement in this respect.

The MASTER of the ROLLS: You may consider it as amended, and take the order for the payment of the £3, or, at the option of the defendant, an inquiry as to quantity.

LAMBETH POLICE COURT.—FRIDAY, Nov. 12.

(*Before Mr.* ELLISON.)

OPPONENTS OF THE CONSTANT SUPPLY SYSTEM.

William Snell, of Falmouth Road, New Kent Road, a member of the Vestry of St. Mary, Newington, and owner of house property in the parish, appeared on an adjourned summons, taken out by the Lambeth Water-Works Company, for neglecting to comply with the regulations regarding a constant supply of water to houses, of which he was owner, in Ingoldthorpe Grove, Glengall Road. The facts of the case were gone into a fortnight since, before Mr. Hosack, and were reported in the JOURNAL (see *ante*, p. 690.)

Mr. BESLEY again appeared for the Company, and pointed out to Mr. Ellison that, although the defendant had to a certain extent complied with what was required, he had entirely cut off all water supply to the closets of the houses. This, he urged, was in itself a very bad feature in the case, for prior to these proceedings there was a supply of water to the closets.

Mr. *H. J. Catmur*, the Chief Inspector to the Company, gave evidence in support of the statement of Mr. Besley.

Defendant said that he was not bound, under the Company's Act, to supply water to the closets, and the Company had no power to compel him to do so. It was the Sanitary Authority who had control in such a matter.

Mr. ELLISON told him he could put any questions to the witnesses, and make his statement at the proper time.

Mr. BESLEY wished to point out the course particularly adopted by the defendant in cutting off the supply of water to the closets—a matter which, as a vestryman, he must know was highly improper.

Mr. ELLISON said he had not lost sight of this fact.

Defendant proceeded to repeat his statements with regard to the authority of the Company, and then condemned Water Companies entirely.

Mr. ELLISON told him he was not answering the complaint, and certainly doing himself no good. He had, he said, promised to comply with the regulations, and the case was adjourned for him to do so. Instead of that he had chosen to deprive his tenants of a most necessary supply of water, especially in a sanitary point of view. He (Mr. Ellison) wanted to hear what defendant had to say to this.

Defendant proceeded, in a warm manner, to express his views upon the question of the water supply and the present Companies.

Mr. ELLISON stopped him, stating that he was not to consider he was addressing a public meeting, or speaking in the Vestry. It was a very serious case. An offence had been committed, and despite the fact of the Company giving the defendant an opportunity to do what was required, he had thought fit to act in a shameful manner by cutting off the supply to the closets. It had, on the first hearing, been suggested that a nominal penalty only would be asked for by the Company. To this he should certainly not agree, but would support the Company, who had a right, in the interests of the public, to see their regulations carried out. Nothing in excuse had been stated by the defendant, and, having acted in a shameful manner in cutting off the supply, he must pay a penalty of £5 and £1 11s. costs.

Defendant said he should appeal against the decision.

William Jonathan Oakley, landlord of houses in Neate Street, Camberwell, was summoned for a similar offence and allowing a waste of water.

Mr. BESLEY pointed out that, independent of there being no proper fittings, the waste of water had been at the rate of about £2 per day during the past nine months. The defendant was a member of the Lambeth Vestry, and, despite every notice given him, nothing whatever had been done with regard to complying with the regulations.

Evidence having been called in support of this statement,

Mr. ELLISON ordered the defendant to pay a fine of £1, and £1 13s. costs.

Another summons against *James Law*, with regard to houses in Wickham Street, was allowed to stand over on his undertaking to do the work.

Mr. ELLISON remarked on the importance of a constant supply of water, and intimated that if defendant did the work there would be but a nominal penalty, otherwise the full fine would be imposed.

Miscellaneous News.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Quarterly Meeting of this Association was held on Thursday last, at the Guildhall Tavern, London—Mr. JAMES HUNTER, the President, in the chair.

The minutes of the previous meeting having been read by the HONORARY SECRETARY (Mr. J. L. Chapman, of Harrow), and confirmed,

The PRESIDENT said the balance-sheet for the year, which had been audited by Messrs. Farrand and Price, showed a balance in hand of £24 18s. 3d.—a most satisfactory state of affairs.

The next business was the election of President for the ensuing year, and the Committee recommended Mr. W. H. Broadberry, of Tottenham, for this office.

The PRESIDENT said he had much pleasure in proposing Mr. Broadberry for President, having known him for many years. In a practical knowledge of gas-making, which was a very important consideration, he believed he stood second to none.

Mr. J. ELDRIDGE (Richmond) seconded the resolution. He said that Mr. Broadberry was not only a practical gas maker, but had taken an active part in the formation of the Association, and in its proceedings ever since.

The resolution was put, and carried unanimously.

Mr. BROADBERRY, in thanking the members for the honour conferred upon him, said he should use every effort to carry on the business of the Association as it had been carried on in the past, and to fulfil the duties of President in a satisfactory manner.

The PRESIDENT next proposed the re-election of Mr. A. H. Wood, of Hastings, as Treasurer.

Mr. C. E. BOTLEY (Wormwood Scrubbs) seconded the motion, saying that Mr. Wood might also be considered one of the fathers of the Association.

The resolution was carried unanimously.

On the motion of the PRESIDENT, Mr. W. A. Valon (Ramsgate) and Mr. J. Chapman (Great Stanmore) were elected on the Committee, in place of members retiring.

The PRESIDENT then proposed the re-election of Messrs. Farrand and Price, the Auditors.

Mr. J. CHAPMAN seconded the motion, which was carried unanimously.

The PRESIDENT next proposed the re-election of Mr. James L. Chapman as Honorary Secretary.

Mr. W. R. COOPER (Banbury) seconded the motion, and it was carried unanimously.

ELECTION OF NEW MEMBERS.

Mr. G. Garnett (Ryde), Mr. H. Eldridge (Northfleet), and Mr. F. D. Marshall (Brentford), were elected members of the Association.

Mr. D. F. GODDARD (Ipswich) then read the following paper:—

MANUFACTURE OF SULPHATE OF AMMONIA.

In bringing this subject under your notice, I feel I owe you some apology for dealing with matters on which so much has already been written; but it appears to me that there are comparatively few gas managers who, as yet, are working up their ammoniacal liquor, while so many might do so with great advantage. I do not propose to take up your time by going into the question of washing or scrubbing gas, nor to enter upon a minute description of the apparatus used in manufacture—this having been so efficiently done by the late Mr. Esson, of Cheltenham, and Mr. Eldridge, before the British Association of Gas Managers, as also in the article in "King's Treatise on Coal Gas"—but briefly to compare the different methods in use, with a view to ascertain the most effective as well as the most economical means of making sulphate of ammonia.

The systems adopted for this purpose are many and varied, but the principles on which these systems work are few and simple. Omitting the most primitive method—namely, that of mixing the acid and the liquor in a lead vessel and evaporating down the resultant liquid to crystallization—as obsolete, on account of its nuisance, danger, and expense, I find there are mainly two, and very often three, operations in every system, viz.:—

1. A means of obtaining the ammonia from the liquor in a gaseous form.
2. An apparatus for fixing the ammonia vapour with sulphuric acid.
3. An evaporating pan to reduce the liquid sulphate of ammonia to the crystallizing point, and sometimes a means of breaking up the fixed salts of ammonia—the cyanides and sulpho-cyanides—which will not be given off by the simple application of heat.

I think it will simplify the discussion to follow, if I consider each operation *per se*, rather than deal with complete processes.

First, then, the means of obtaining the ammonia in a gaseous form. For this purpose some use an ordinary egg-ended boiler, or, at all events, a boiler without internal flues, into which the liquor from the works is placed. It is heated either by the direct action of a fire over which it is set, or by the introduction of steam into the liquor; the latter way being decidedly preferable, except on works too small to have a steam-boiler. The heat must be applied slowly at first, until the carbonic acid and other noxious vapours are all driven off; the ammonia vapour, as formed, then passes from the boiler through a pipe to the sulphuric acid vessel. When the ammonia is all driven off, some lime is introduced into the boiler to break up any fixed salts of ammonia which may remain in solution.

Others use a column, after the design known as a Coffey still, containing many shelves, over which the liquor, entering at the top, passes, traversing each shelf in succession until it reaches the bottom, where it finds an outlet. The steam enters near the bottom, and passes also over the trays, but in an inverse direction, heating the liquor, and causing it to give up its volatile ammoniacal vapours, which, with the steam, pass out at the top of the still to the acid chamber. To obtain the best results, the liquor from the still should be passed into another vessel, and heated or stirred up with lime, to ensure no ammonia being lost as fixed salt.

In comparing these two plans, it seems that the former has the one advantage of dealing with the fixed salts of ammonia in the same operation as the volatile salts; while the latter requires another operation for this purpose; but, in my opinion, this does not compensate for the other advantages gained by using the Coffey still—namely, a saving of fuel by not having to heat so large a volume of liquid; less danger of nuisance from the foul gases (these, being given off more regularly and in smaller quantities, may be effectually burnt in the boiler furnace); and from its being almost a continuous process—there being no boiler to empty and refill—more work in a given time.

Secondly, the apparatus for fixing the ammonia vapour with sulphuric acid. This, commonly called the saturator or absorber, is also of two forms, which may be designated the open or crystallizing saturator and the closed saturator. The former is usually of a rectangular form, made of stout timbers lined with 14 lb. lead. Half the top is covered over and divided from the other part by a lead partition, which descends nearly to the bottom. Into the covered portion the pipe from the still enters, and lies along the bottom, being perforated with holes for the emission of the ammonia into the acid, while from the cover there rises a pipe to carry off the carbonic acid and sulphuretted hydrogen evolved. Some mother liquor and acid are put into the saturator, sufficient to seal off the covered portion, and the still is started; acid being added constantly as needed, and of such a strength as to produce crystals which are fished out and placed on a drainer. With the boiler arrangement of still this goes on until all the ammonia is driven off; with the Coffey still it may be continued as long as desired.

The closed saturator may be of similar construction, with the simple difference that the top is all covered in and quite tight. A charge of sulphuric acid is put into it, care being taken that the acid is not too strong, or crystals will be formed in the saturator—a result to be particularly avoided. I find acid of from 40° to 50° Twaddel the best strength. When the charge has been neutralized, as is ascertained by testing, it is run off through a regulus cock or lead plug into an open vessel, where any foreign matter or dirt may settle. Thence it is passed on to the evaporating pan, where, by means of steam-pipes, it is reduced to its crystallizing point, and the sulphate taken out as formed, and placed on a drainer.

The treatment of the carbonic acid and sulphuretted hydrogen is similar in both forms of saturators. The pipe conveying them may, I believe, be advantageously intercepted with another box containing sulphuric acid, to arrest any ammonia that might be taken up with the foul gases; but I cannot speak from experience on this matter. It must then pass through some form of condenser, and the uncondensable gases are carried into the boiler furnace or into the flue of the retort stack.

In comparing these two methods of fixing the ammonia, it would appear that what is done in the open saturator in one vessel requires three vessels when using the closed saturator. The former is therefore undoubtedly the cheaper to erect, and probably the more suitable for small works. Where it is desirable to make white salts, the results are more likely to be satisfactory by using the weak acid saturator and evaporating pan rather than that in which strong acid is used, as this tends to char and blacken any organic matter that may be present. It will also be more difficult to maintain the highest percentage of ammonia in the salts where these are taken from a strong acid solution, as the acid which hangs to the crystals would increase the weight, besides rendering the sulphate more liable to deliquesce. I may say, however, that I have seen some very excellent white sulphate produced by Mr. Browning, of Colchester, with the open saturator.

To come to the points of most importance to gas managers. Is it better to sell the ammoniacal liquor than to erect plant and manufacture sulphate? I think, with few exceptions, certainly the latter. Where works are so situate as, by water carriage and proximity of manufacturers, to command such a price as 1s. per ounce per butt, or say 20s. per ton, it would, I should think, be wisest to let well alone; but then how few have such offers. The usual price with us is about half the sum I have named, and in all such cases it will be found highly advantageous to manufacture and sell the produce, as the following figures will show; they are based on a fair week's work, although the quantity produced could be increased by working for a greater number of hours:—

Three tons of sulphate, at £18 5s. per ton			£54	15 0
Labour (one man), at 10d. per cwt. . .	£2	10 0		
Fuel (rough breeze) 52 cwt., at 9s. per ton	1	3 6		
Acid, 3 tons, at 70s. per ton	10	10 0		
Repairs, &c., 15 per cent. on £500	1	8 9		
			15	12 2
Balance of profit.			£39	2 10

I estimate that it would require 8640 gallons of 10-oz. liquor to produce 3 tons of sulphate—that is, 80 butts, at 1s. per ounce per butt, £40, showing at that price a slight advantage in favour of selling the liquor.

As to the question of the best apparatus to use. In small works, a boiler set over a furnace, with the crystallizing form of saturator, would, no doubt, be cheapest and best; but in works where there is sufficient liquor to keep the apparatus generally in operation, I should recommend the Coffey still and closed saturator, as being most economical, most continuous, and requiring least attention.

I may say, in conclusion, that had I known, when the Committee asked me to read a paper on this subject, that Mr. G. E. Stevenson would deal with the same topic before the Midland Association, and that we should have the pleasure of reading the description of his apparatus in the JOURNAL OF GAS LIGHTING, I, who use an almost identical form of plant, would have chosen another subject for consideration this afternoon.

Discussion.

The PRESIDENT said he was not a sulphate manufacturer himself, as he was able to get rid of his liquor at something like the price which had been named in the paper, and he was not, therefore, in a position to give a practical opinion on the matter, but no doubt many others present could do so.

Mr. BROADBERRY asked Mr. Goddard how he dealt with sulphuretted hydrogen in his apparatus. That point had not come out so fully in the paper as he (Mr. Broadberry) should have liked, for sulphuretted hydrogen was the principal difficulty, especially in small works.

Mr. GODDARD said that at one time, after condensing the sulphuretted hydrogen gas as far as possible, he passed it into the furnace under the boiler, but he found that it spoilt the boiler. After repairing the boiler they started again, but then he found many complaints, coming from about two miles away from the works, of nuisance from the smell given off. For some time people did not give the gas-works credit for it, but after blaming every factory in the neighbourhood in turn, they came to the conclusion that it was the gas-works, and when about three miles from home one day he was very much astonished at the smell, for in the neighbourhood of the works there was no smell whatever. On the hill, however, 2½ to 3 miles off it was disgusting, to say the least of it. After this they had to adopt another method, and now they had no complaints whatever. He had about 84 yards of 6-inch pipe as a condenser, and 30 yards of 16-inch pipe. He used a steam-jet exhauster, and conveyed the gases from the saturator, and his idea was that the steam would drop, which it did, and he found no difficulty in reducing the temperature to that of the atmosphere. He then passed the gas through an oxide purifier. Since adopting this method they had had no complaints whatever. In reply to another question, he said that where the boiler form of still was used, and the sulphuretted hydrogen was given off at once in large volumes, it was much more difficult to deal with. He believed, if the fact were generally known, it would be found that most gas managers who adopted that plan of working tried to start their operation either in the night, or so early in the morning that any objectionable fumes arising from it were not noticeable. But where the Coffey still was adopted the amount of sulphuretted hydrogen given off was regular throughout, and in small quantities. He had simply a 6-inch hot-water pipe commencing in a lead pipe from the top of the saturator, then came the 6-inch pipe, which was carried backwards and forwards in a shallow concrete tank about 20 ft. by 12 ft., the pipes being covered with water, and then, after allowing an outlet for the condensable matter, he conveyed it to the boiler fire. He did not know that there was any offensive odour from the shaft, dealing with it in that way. In fact, one might see the gases burning at the end of the pipe in the boiler fire, and when this was done his experience was that there was no offensive odour arising from it.

Mr. BROADBERRY inquired about what quantity of coal could be dealt with by the apparatus Mr. Goddard had described, the cost of which he gave at £500.

Mr. GODDARD said about 12,000 tons. The £500 he mentioned really included the building, which was made of concrete, and cost under £200, and the apparatus he made and erected himself; consequently the cost of it was very little. He believed £500 would cover everything in the building.

Mr. MARSHALL said that in the various processes described by Mr. Goddard there seemed to be a considerable difficulty in satisfactorily disposing of the sulphuretted hydrogen formed. Some engineers burned it under the boiler furnace, while others turned the gas into the retort stack; but with both these methods there seemed a danger of the gases "firing back." Few, it appeared, adopted the process of passing the sulphuretted hydrogen through oxide, although this was quite feasible, providing that it was freed from aqueous vapour by condensation; otherwise the purifier would soon get into an undesirable sloppy state. Another method for disposing of the sulphuretted hydrogen would be to burn it with nitrate of soda, and so manufacture sulphuric acid. Or another method would be by burning it, and passing the evolved sulphurous acid into water. A solution of sulphurous acid would thus be obtained, which could be used for the manufacture of bisulphite of ammonia from gas liquor. The bisulphite of ammonia readily absorbed the sulphuretted hydrogen, with the formation of water, and a deposition of sulphur which could be regained for future use.

Mr. J. L. CHAPMAN said there was one point he could speak upon—viz., the question of the open system, which was the one he adopted. Mr. Broadberry had said something about the nuisance complained of under this system, but his (Mr. Chapman's) house was about 300 feet from the works, and they had had the sulphate apparatus going for some time, but had never had a single letter nor complaint to the Company with regard to any nuisance. They carried the fumes through a pipe from 70 to 100 feet long, which acted as a condenser, catching the condensed liquid, and passing it over the tops of the retorts into the retort flue; and up to the present time they had never experienced any nuisance whatever. They had an earthen vessel of acid with an earthen tap, and when they began sending the ammonia from the boiler into the saturator they turned the tap on very gently, so that the acid continually met the stream of ammonia, and thus the acid and ammonia were maintained as nearly equal as possible, thereby always keeping a regular flow, as Mr. Goddard described in the closed system. But he thought his (Mr. Chapman's) was more regular, because when the ammonia was let to flow into fresh acid, there must be a greater evolution of sulphuretted hydrogen than towards the close of the process. At Harrow they only put in as much acid as ammonia. As to the economy of the system, his was a small works, but they found they could work the open system very cheaply indeed. His leading stokers took the work in hand, with their regular employment, at a small price per ton of oxide made. They were 3 miles from the railway station, and 2½ miles from a canal, so that it was absolutely impossible to move the liquor; but with this system they were going on very satisfactorily, and he believed that for small companies, placed in difficult positions, the best thing was to adopt the open system; for, if carefully managed, it would show a fair profit to the Company. The liquor was boiled in a straightforward manner by putting the fire underneath. The boiler held about 300 gallons of liquor, and it was boiled for 16 or 18 hours. It took about 3 hours to get it up to boiling point, and they employed for this purpose about 6 bushels of coke; but during the remaining hours they used nothing but the smallest coke breeze, which really cost nothing.

Mr. LANE asked if Mr. Chapman would prefer a fire under the boiler to a steam coil, or would it not be better to put the two in operation together? He said he found that the amount of ammonia which ran from his boilers was rather great, but they did not use a lime agitator. If the two heats were applied at the same time, it might effect a greater economy. In some works the Coffey still could not possibly be used.

Mr. CHAPMAN asked if Mr. Lane meant that the ammoniacal liquor ran off too strong at the end.

Mr. LANE said he did. He almost thought it would answer his purpose better to sell the liquor at the price which was being offered.

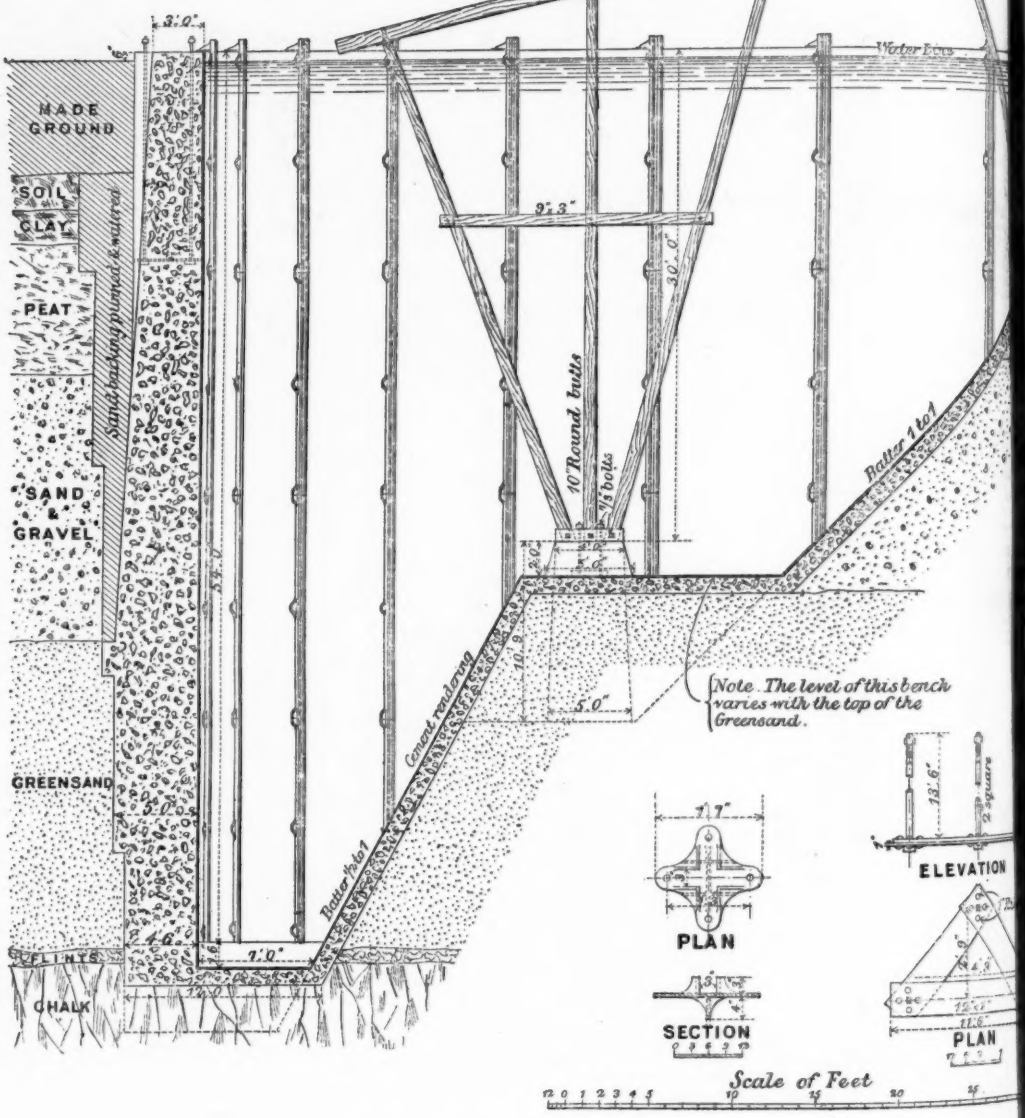
Mr. CHAPMAN said perhaps Mr. Lane was close to a railway station.

Mr. LANE replied that he was; they had a siding into the works. What he wanted to know was whether the steam coil and fire heat could be applied at the same time, and would it not be better than the steam coil itself, and also whether it was really beneficial to use the lime agitator? In some large works he had been informed to the contrary.

Mr. C. GANDON (Sydenham) said there was one point which Mr. Goddard had not touched upon, on which he should like to elicit some information, and that was the quantity of sulphate obtained per ton of coals. He was induced to refer to this because he had just been reading the recently published report of a paper on the same subject read by Mr. G. E. Stevenson at the meeting of the Midland Association of Gas Managers, and there seemed to be very variable statements as to the amounts obtained. Mr. Stevenson produced 24 lbs. per ton, at Leeds they obtained 31 lbs. of sulphate per ton, and at Cheltenham 34 lbs. was said to be made. For his own part he was unable to obtain more than about 20 lbs. There must be some reason for these differences. At any rate he should consider he was working very badly indeed if he was wasting the difference between 20 lbs. and 34 lbs.; but he did not believe he was working wastefully. He had no doubt a great deal of the difference was due to the variation in the quality of the coal used, for they all knew that some coals contained much more ammonia than others. At the same time he was not at all satisfied with his own results, and should like to find out the way to get better ones. They used lime, and he had made experiments from time to time to ascertain whether it was at all worth while to do so. Some little time ago he made an analysis, and found that the waste liquor contained ammonia sufficient to form about 341 grains of sulphate of ammonia per gallon—equal to about 1 cwt. of salt to be obtained out of a ton of liquor. This alone showed it was worth while to work up the waste liquor. At other times he had found more than double this amount of ammonia in the waste liquor. There could be no doubt, therefore, that it was worth extracting; but whether the whole of it was obtainable by simply treating it with lime was a question. The 341 grains he named were obtained by treating the liquor with caustic soda, and it was astonishing how difficult it was to drive off the ammonia even with this material. He had found it necessary to boil the liquor for an hour or more, and with lime he had boiled it until he was tired, and then could not get the ammonia all away. He was not prepared to agree with Mr. Goddard that the Coffey still was more economical in point of fuel, although he had had much experience with the boiler system. There was undoubtedly a great waste of steam sometimes; the waste liquor came out of the bottom of the still, and the steam entered almost at the same place, and in practice a great deal of the steam, instead of going up the still, went out with the waste liquor. He had tried to prevent this by putting the outlet-pipe of the waste liquor into a seal, but the result was that it frequently blew the liquor over into the saturator, which was perhaps even worse than wasting a little steam. He did not take much account of the steam, because at his works they simply used ash-pan breeze for making it. Still the question of fuel was an important one. Mr. Goddard put £1 3s. 5d. for fuel for making 3 tons of salt. He (Mr. Gandon) did not know what rate he took it at, but if they used good coke it would require about a chaldron to make a ton of sulphate. He did not quite agree with Mr. Goddard in some of his details; but in the result he very nearly agreed with him. As to the foul gases, they at Sydenham did at one time attempt to burn them under the boiler furnace, and he very frequently found there was a great nuisance from them. If the furnaces required clinkering, the gases could not pass up through the clinker, or if they had just been clinkered, and coke put on, there was nothing to consume the gas. They had, therefore, now adopted the plan of turning the gases into the main flue at the top of the retorts. How people at a distance might like it he did not know, but he had not heard any complaints; still as the gas given off was mostly sulphurous acid, he did not think any inconvenience was suffered. With regard to the labour in making the salt, which was also a point referred to in Mr. Stevenson's excellent paper, the statement was made that the cost of manufacturing sulphate at Leeds was 8s. per ton. Mr. Stevenson gave his cost at 24s., and this difference was enormous. He (Mr. Gandon) thought this must be due to some different way of keeping the accounts. He never heard of salt being made at 8s. per ton, though he had known, in a very small works, where the stokers had a little spare time, they used to give them 12s. or 14s. a ton to look after the sulphate apparatus, and as it was an open affair it was not much trouble to do this. That was the cheapest he had heard of. At his own works they paid 22s. per ton for making the salt, which included labour and all repairs, but the Company had to find materials. Altogether it cost, taking the renewal of plant and all, about 28s. per ton, or £1 per ton more than it was stated to cost at Leeds. He did not know whether or not this was due to their bad working, but he should be glad if any one could show him how to do it cheaper.

Mr. BOTLEY asked whether Mr. Goddard used the lime process. With regard to the advantage of selling liquor or manufacturing it, he might state that he found such difficulty in getting rid of his liquor, that he was about to put up plant for the liquor from about 12,000 tons of coal per annum, because they could not get rid of it at a fair price. But even without this difficulty, there were endless disputes with manufacturers as to the strength of liquor sold. They were determined to give up the sale of liquor altogether, and make sulphate themselves.

Mr. ELDRIDGE said the question of nuisance was no doubt a very serious one. He had now been making sulphate for the past ten years, and certainly had had just a few complaints; but none that were persisted in. Sometimes persons professed to smell something when there was nothing to smell. For instance, not long ago he was talking on the subject to a gentleman who would not believe that sulphate of ammonia could be made without causing a serious nuisance. A few days after he was going through the gas-works, and, sniffing very obtrusively, said: "Now, what do you say? Is there no smell to-day?" observing that the wind was coming right in the direction from the apparatus. The fact was, however, they had not been at work for a week. Nevertheless, he (Mr. Eldridge) must say that they had sometimes not felt quite comfortable, and could perceive that there were slight smells about. Some time ago he tried the following plan, which answered very well:—Instead of putting into the saturator the ordinary dilute acid—say half water and half sulphuric acid—and driving the ammoniated steam from it into the boiler, he filled up the saturator (a tank about 5 ft. by 3 ft. by 2 ft. 6 in.), nearly full of water. He drove the steam from the boiler into it, and let a very little acid dribble in from an elevated tank, a few drops at a time; and that continued during the whole process, which went on for about twelve hours. When he wanted to take it out for the purpose of putting it into the evaporator, it was a bad colour; but the next process would be to syphon it into a settling-tank, and then to syphon it into another evaporator. Using so large a quantity of water, he never formed any salt in this saturator. At first they used to form salt in the saturator, and dig it out; but now they syphoned it out into the settling-tank, and when it had stood there about six hours, put it into the second evaporator. They now found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10" Round butts
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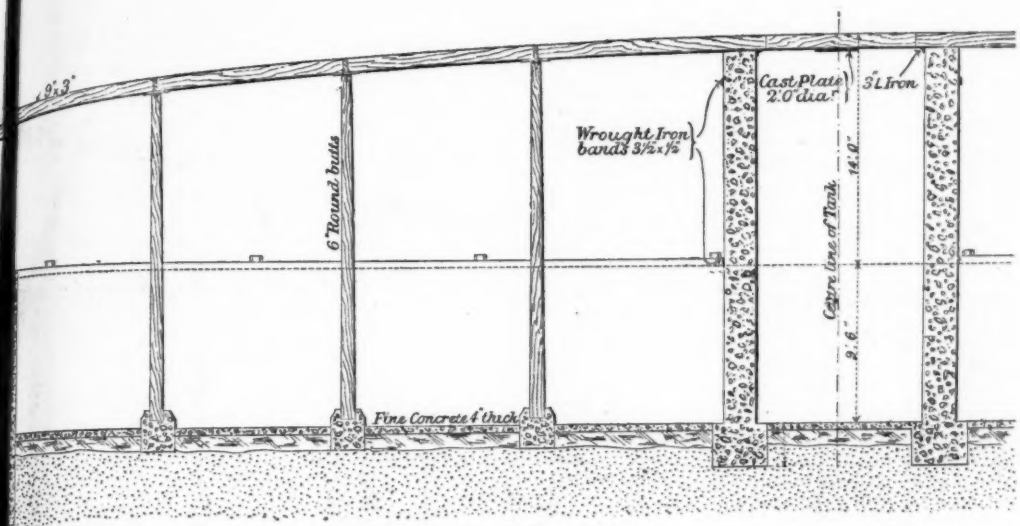
GAS NY—OLD KENT ROAD WORKS.



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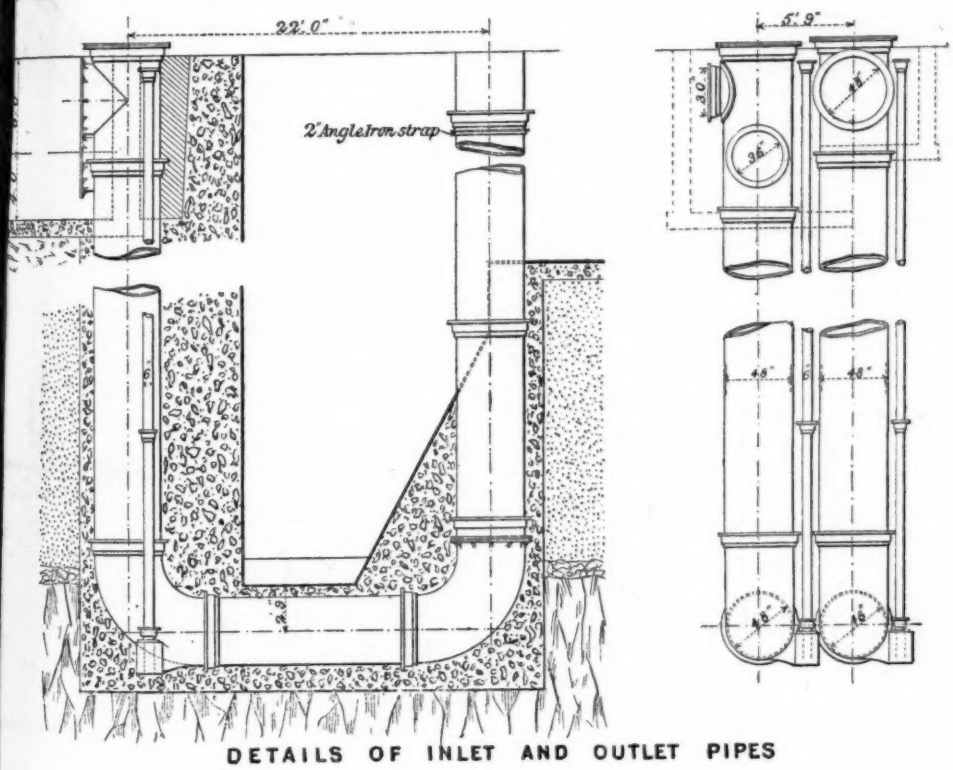


DETAILS OF INLET AND OUTLET PIPES

GEORGE LIVESEY, M.Inst.C.E., Engineer.

T AMETER BY 55 FEET DEEP.

no smell at all, even working with a perfectly open saturator, although, as a matter of precaution, they had a pipe fixed which led from the top of it to the furnace. A question had been raised about lime, and he must say that up to lately he had always thought it was no good using lime. The general impression was that it did not pay for the trouble, and the little that was lost was very trifling. Some time ago, however, he fixed a tank about 6 feet in diameter, and 4 feet deep outside the works altogether, so arranged that he could draw the spent liquor from the boiler into it. He put a coil at the bottom of it, and churned the liquor with lime. This soon settled the question in his mind as to the value of using lime. Mr. Gandon some time ago said there could be no question about its being of no use, and others said the same; but by the means he had described he obtained very fine salt indeed.

Mr. VALON said he had listened with great pleasure to the paper and discussion. As far as the cost of manufacturing was concerned, his results agreed as nearly as possible with the figures Mr. Gandon had given; in fact, he agreed with him in almost everything he had said, excepting in the quantity of salt he manufactured per ton of coal carbonized. He presumed at Sydenham they used Newcastle coal, the same as he (Mr. Valon) did; but he got about 24 lbs. to 25 lbs. of salt per ton. With regard to the question of getting rid of the noxious vapours, he used steam to drive off the ammoniacal vapours into the saturator. He used the open system, mixing the acid in the proportion of two parts of water to one part of 80 per cent. acid, and they put it all in at once. They then drove the fumes over until the liquor was saturated, then put it into a settling-tank, and then re-pumped it into the evaporator. To get rid of the fumes they had a 6-inch pipe from the saturator, which discharged on the top of the furnace immediately under the boiler—not in the ash-pan, as if there were any clinkering or anything of that kind the fumes would come out and choke the men. He had tried in every way to find, either close to the works or at a distance, anything of a noxious character, but had failed to do so. They did find sulphurous acid gas which fell down close to the works, but nothing more; and they had no complaints from their neighbours. He therefore had no reason to think that any other system would be better than the one he adopted.

Mr. BROADBERRY said he had compared his cost with the figures given by Mr. Gandon; and also, on reading the account of the meeting of the Midland Association, he was much struck with the discrepancy in the quantity of salt made. At his works they had made ammoniacal salt for many years. He found that his fuel cost about 8s. per ton of salt made, and the labour about 18s. per ton, whilst he made about 22 lbs. of sulphate per ton of coal carbonized. This included repairs and all, because the repairs were kept apart, and not mixed up with other labour. With regard to the use of lime, he had employed it, and found that he really obtained about 9 per cent. more salt in consequence. He did not always use it, however, because in changing men they sometimes found a difficulty in getting them into the system, and when a fresh man was put on they did not use the lime until he was well acquainted with the work. With regard to applying heat direct or by steam, he applied direct heat for about 15 months, but had to alter it to steam—not a coil, but a perforated pipe which ran along the bottom of the boiler from which he blew the steam direct into it. He thought this was more effective than a coil. He had to do this because when the ammonia first began to come off, if the heat were applied direct, it sometimes came off more quickly than it could be dealt with, and by this means they found they lost a large quantity of ammonia, not using a check tank. By using a check tank perhaps the difficulty might be overcome; he, however, still thought the steam was preferable, because the evolution of ammonia could be regulated much better by its means.

Mr. VALON said he had tried lime to commence with, and found it rather a dirty process and a great nuisance, and he had since tried to do away with it, and succeeded in the following way:—They took the spent liquor, ran it out into a tank and cooled it, and then ran it again into the washers and used it over and over again. Of course it decreased, and they had to add pure water to the scrubber, but the spent liquor was passed into the first washer.

Mr. GANDON said he was doing the same thing with his waste liquor to a great extent, although he did lime a portion of it.

Mr. ELDRIDGE said he had tried this plan, but found it impossible to get rid of the liquor.

Mr. VALON could not understand this, because every time the liquor ran through the boiler it must be reduced in quantity, and therefore he could not see why they could not get rid of it.

Mr. E. PRICE (Hampton) said he had carried out this plan with success for about nine years, running the liquor back again after extracting all the ammonia, and therefore he did not trouble about the fixed ammonia. It went back into the tanks, and was worked over again. The question of nuisance was a most important one to consider. They had all been troubled more or less with this matter in the manufacture of sulphate; at all events, he had, and had tried various plans to get rid of it. He first tried condensing the fumes, but without success; then he tried running the fumes into the flue of the retort-stack, and carrying them up into a shaft about 120 feet high; but then he found that complaints were made, about a mile from the works, that the gases fell near the Hampton Court Palace, and therefore he had to abandon the system. Then he tried another plan, by running it direct into the front of the settings, so that it travelled along the flues; but this was very destructive to the retort-benches, and he was obliged to abandon that also. Then he tried another plan of burning them under the boiler. He had at the present time an egg-ended boiler, and he ran the fumes into the side of the furnace directly over the fire, and this he found to be successful; but before they came into the furnace he had a closed system of saturators. Between the saturators there was a catch cistern, so that all the fumes went over into this catch tank, and then there was another outlet from it which took away the steam, so that the liquor or the water ran away from this middle or catch tank, and did not go round into the tanks. Then he had also another one outside the works under ground—a little tank which also caught the liquor that might travel along from the tank outside. Since he had adopted this system he had never had the slightest trouble or complaint from any one. A great deal of the success, however, depended on having a good draught in the furnace, and unless there was a good draught the fumes would not burn away. He had just erected a new Cornish boiler, with which he could obtain any amount of draught, and he did not find the slightest difficulty in consuming the fumes.

Mr. ELDRIDGE said there was this advantage about the lime, in using it and putting the spent liquor into the lime tank, and passing steam through it, the water in the tank was made fit for anything, so that if it was necessary to throw it over hot coke, or, as some of his friends did, send it to the Atlantic and other places, there was no annoyance caused; in fact, the water when it ran out of the tank might be thrown anywhere, and this was an additional advantage from the use of lime, besides the saving of salt.

Mr. MARSHALL said, with regard to the decomposition of the fixed salts of ammonia—viz., the carbonate and sulphide—doubt existed whether the mere action of steam would effect the entire decomposition of the salts; but from various experiments he had carried out he was induced to think that the decomposition was not complete, as the following analyses would show:—

NH_3.		CO_2.		H_2S.	
Cubic Inches per Gallon.		Cubic Inches per Gallon.		Cubic Inches per Gallon.	
Before Heating.	After Heating to 200° Fahr.	Before Heating.	After Heating to 200° Fahr.	Before Heating.	After Heating to 200° Fahr.
9804	5635	3396	615	2115	1275

The samples of liquor were heated to 200° Fahr., and the carbonic acid, sulphuretted hydrogen, and ammonia were estimated before and after heating. After heating, both the two former existed in the combined state—viz., as carbonate and sulphide of ammonium; clearly pointing to the fact that the reaction was not complete, and that those who were content to simply heat their liquor, and neglected to use lime, must suffer a considerable loss of ammonia, to say nothing of that which existed as cyanides.

Mr. J. HAMMOND (Lewes) said the vital question in the paper appeared to be whether it was better to sell the liquor than work it up into sulphate. He thought they ought as managers to make the most of the ammonia before disposing of it, either as residual liquor or as sulphate of ammonia, and they could do this by utilizing it for purification purposes. He had a little apparatus which he used in this way: A small pump was at work continually night and day drawing say 50 gallons of crude ammoniacal liquor per hour from the ordinary tar and liquor well. The liquor was forced through the apparatus and purified therein before reaching the scrubber and washer. Steam was not brought into direct contact with the liquor, but the plant was so arranged that he used a very small amount of steam to drive off almost the whole of the sulphuretted hydrogen and the carbonic acid from the liquor. These gases carried off also a small quantity of ammonia, which became converted to sulphate in the saturator, while the hot liquid ammonia flowed on through the apparatus, heating in its course the ascending crude liquor, and flowing out cold to the scrubber and washer for the purification of the gas. So that he needed no Coffey still, no boiler set over a fire, nor did he need a steam-pipe leading into a large boiler with a great bulk of ammoniacal liquor under treatment at one time in order to manufacture ammonia sulphate. By continually pumping a small stream of liquor through the apparatus and driving off by steam-heat the impurities, combined with a small quantity of ammonia, through acid, he could produce good sulphate, and at the same time greatly assist in the purification of the gas with the purified liquor. To dispose of the surplus liquor he had provided a little receptacle which would catch the purified liquor while hot. This was arranged at a certain height, and the liquor flowed in a regulated quantity into small vessels for treatment with lime and high-pressure steam, thus producing strong ammoniacal vapour and liquid ammonia, which could be led away to assist in purifying the gas, or forced through the acid in the saturator for sulphate making. He therefore had two distinct processes at work in dealing with the ammoniacal liquor, and he found it best, because by dealing with it in this way, he did not increase but rather decreased the quantity of liquor remaining to be treated with lime. He had been working at this matter for some years, and was so pleased with the results, that he hoped at some future day to bring the matter before the Association in the form of another paper; but having been in some confusion for the past two years with necessary extensions and alterations of gas-works plant, he had not been able to fulfil the promise which he made when he read his former paper. It was certainly clear to him that there was a very easy way in which they could make use of ammoniacal liquor over and over again for the purpose of purifying gas, and at the same time convert only the surplus liquor into sulphate of ammonia. He had never any very strong carbonate or sulphide liquor on the works. The continuous treatment with steam kept the bulk of the liquor as low as 21° Twaddel, but it really contained 14 ounces or more of ammonia per gallon, which made it so valuable as a purifying agent; and the small but continuous quantity under treatment at one time prevented any danger or nuisance from excess of foul gases. If they could combine the process simultaneously of manufacturing sulphate and the purification of gas, he thought it would be far more profitable, and better than sending the crude liquor off the works as soon as made.

Mr. MARSHALL said, with regard to the sulphate made per ton of coals, this seemed to vary greatly with different makers. Mr. Goddard had, he believed, stated that he obtained 24 lbs. of sulphate (of 25 per cent. quality) per ton of coals. This was very good working. They had heard statements of results approaching 34 lbs. of sulphate per ton of coals, but this would probably be accounted for by the makers using inland coal very rich in nitrogen. The practical results obtained by makers who used Newcastle coals, and who made 30 gallons per ton of 8-oz. liquor by the "acid" test, equal to 9-oz. liquor by the "distillation" test (this showing the total amount of ammonia available), was, he believed, about 23 lbs. of sulphate per ton, and this would be theoretically correct, for assuming that 1 ton of coal produced 30 gallons of 8-oz. acid liquor, or 9-oz. "distillation" liquor, then 100 tons of coal would give 3000 gallons, or 28 butts, and this would produce theoretically 22·87 lbs. of sulphate per ton. Taking as a basis 1 oz. of strong acid to equal 0·347 oz. of ammonia, then by taking the "distillation" ounce strength, say 9 oz., and multiplying by 0·841=7·569, divided by 10=0·7569 lb. of sulphate per gallon, or 2287 lbs. of sulphate per 100 tons of coal, or 22·87 lbs. per ton.

Mr. JOHN CHAPMAN said he was glad to find that though Mr. Goddard had stated that small works could not set up valuable machinery for making sulphate, still he gave some hope to those who were engaged in small works that they could make something out of their liquor by taking care of it.

Mr. T. MAY (Canterbury) said he had manufactured sulphate of ammonia with a good deal of success, and with no nuisance. His was the close process, and the noxious gases from the saturator were taken to the boiler, the flue of which was connected with the chimney-shaft. No nuisance had arisen, nor had they had any complaints for years, though last year they manufactured 84 tons of sulphate. The apparatus was economically manufactured on the works, and cost £150, including the boiler, saturator, depositing tank, evaporator, and drainer, and also all the pipes and setting the brickwork. The saturator was entirely of lead, set alone and circular. The sulphate made was a white first-class article, and he produced 22 lbs. per ton of coal carbonized. The cost, including fuel, labour, and packing, was 20s. per ton. This did not include any repairs, because there had been none since the apparatus was set up.

Mr. GODDARD, in reply to Mr. Marshall, as to getting rid of the nuisance, said his own experience was that there need be no nuisance. They ought properly to condense the sulphuretted hydrogen and carbonic acid gas through a water condenser such as he had described, and then carry the fumes to the fire of a Cornish boiler, not below the fire-bars, but above

them, where there was nothing to prevent them being driven off. If there was a nuisance it might be wise to consider the advisability of following out Mr. Marshall's idea; but he need not remind the members that the more complicated they made these processes the more necessity there was for skilled labour in working them, which was not desirable. Mr. Chapman had said something about the ammonia given off being irregular, but with the Coffey still arrangement this was not so; there was always the same quantity of liquor passing through the still—averaging from 150 to 200 gallons per hour. This only represented a given quantity of sulphuretted hydrogen, and was always the same. In reply to Mr. Lane's question as to applying two heats at once, he should say there could be no advantage in doing it. The great object in introducing steam into the boiler was to reduce the fuel underneath the boiler, and also because if there were direct heat, too great a heat might be applied at one time, and the ammonia be driven off too quickly, when some would be lost. The heat would be readily stopped in a moment if it were found that the ammonia was coming off too quickly. Where a boiler was used, and the steam introduced into the boiler with the liquor, no agitator was required for the lime. In reply to Mr. Gandon as to the make of sulphate per ton, he believed the difference in quantity made by different companies was entirely due to the different kinds of coal which they used. He had made some very careful examinations with the view of obtaining a basis to go upon, which would work out very similar to the figures given by Mr. Marshall—namely, as to the quality of liquor and the strength of liquor used in washing the gas. If they knew what was the strength of the liquor they obtained, they could easily calculate what amount of sulphur they ought to get. The result of his tests on the scrubber was that he passed between 24 and 25 gallons—to give the exact figures, 24·75 gallons of water per ton, and this came from the bottom of the scrubber 14-oz. liquor. Working in this form, which was theoretically correct, the 14 oz. liquor produced 17·5 oz. of sulphate per gallon, which practically was 27 lbs. of sulphate per ton of coal. He did not say he had obtained these results, but was merely giving the quantity of water used in scrubbing, and the strength it came to. Even if it only produced 14 oz. of sulphate of ammonia per gallon, it would represent 21 lbs. of sulphate per ton of coal carbonized, without at all reckoning the liquor which was formed in the hydraulic mains or through the condenser. He, therefore, could see no difficulty whatever in the figures running up to 24 or 25 lbs. per ton of coal. Where some Yorkshire coal was used the figures that were quoted by the late Mr. Esson, of 24 lbs. per ton, might be correct. As to the question whether lime was sufficient to get all the fixed salts from the liquor resulting from the still, he did not think it was, for a moment, but it was easily tested. He had tested it, and found some sulpho-cyanide of ammonium left. Simply by applying a persalt of iron to the liquor, the presence of sulpho-cyanide of ammonium was detected by the deep red precipitate; and he found that really all the sulpho-cyanide of ammonium could not be got rid of. However, a great deal of it could be got rid of—quite enough to make it worth while. As to the waste of steam, which Mr. Gandon complained of, in using the Coffey still, he (Mr. Goddard) could not say that he found the difficulty he spoke of, of the steam coming out from the bottom of the still. Probably he did not work in exactly the same way. At Ipswich he did not get the liquid running from the still, but there was a space at the bottom of the still below the shelves, and the liquor accumulated there to perhaps 12 or 18 inches. It was tested from time to time to see that the free ammonia was all extracted from it, and when this was found to be the case it was allowed to be run off, and the cock of the apparatus was shut again. By this means there was no material waste of steam. He need not enter into the question of labour, but his labour was a fixed sum. He paid his one man for the sulphate 10d. per cwt. according to the amount sold. In reply to Mr. Botley, he might say that up to the present time he had not been in the habit of using the lime process at all, but he most firmly believed it was worth while to do so, and was now erecting plant for the purpose of using it. As to putting a large quantity of water into the saturator, as recommended by Mr. Eldridge, he would remind them that the more water they had in the saturator the more fuel would be required to evaporate it down to the crystallizing point, and that therefore it must be rather more expensive. One gentleman had said that they used the spent liquor, or fixed salt liquor, as he called it, in the washers, and that was certainly a way of getting rid of the liquor for a time, but he could not see that it did any permanent good to the gas. The fixed salt liquor had simply some sulphide of ammonium and some sulpho-cyanide of ammonium in it, and in course of time the fixed salt in the liquor must be increased, and there would necessarily be greater waste than if it were removed. He, therefore, thought that the better plan was to remove it at once by means of the lime process, rather than use it in the washers. As to Mr. Marshall's question, whether the whole of the ammonia was extracted by steam, he did not think any cyanide of ammonium was extracted by steam, but simply carbonate and sulphate.

Mr. MARSHALL said the point was whether they were thoroughly extracted by steam.

Mr. GODDARD thought that if the sulphide and carbonate of ammonia were not driven off by steam, they would be detected in the liquor by means of a test-paper. He thought, therefore, that these salts of ammonia, which should perhaps be termed the volatile salts, were all driven off, but that the cyanides and sulpho-cyanides were not touched at all. The quotation that 30 butts of 8-oz. liquor would produce a ton of sulphate, was, as near as possible, the same as the figures he had given—80 butts of 10-oz. liquor to produce 3 tons.

Mr. MARSHALL said this was the amount the London manufacturers were now reckoning upon, so that Mr. Goddard's amounts tallied very correctly with them.

Mr. GODDARD said he quite agreed with Mr. Hammond that if they could put the ammonia into a utilizable form before manufacturing it into sulphate, it would be greatly to their advantage to do so, but he thought at present there must be some little difficulty in doing it; because, although they had heard that Mr. Hammond was doing it, he did not exactly understand how he accomplished it, and he could not ascertain that anybody else was doing as Mr. Hammond said he did. He should, therefore, be only too glad when his ideas were laid before the Association in such a way that they could adopt some process whereby they could convert all their ammoniacal liquor into caustic ammonia for the purpose of purifying gas before making it into sulphate of ammonia for sale.

The PRESIDENT said he had been much pleased at listening to the discussion, and it had given him many new ideas, which, no doubt, would some day be useful to him. On reading in the JOURNAL OF GAS LIGHTING the paper to which reference had been made, there seemed to be a good deal of discrepancy as to the results both with reference to the quantity of salt produced and the cost. As had been truly remarked, the strength of the ammonia ought to be given in all cases, so that they might arrive at something like a criterion of each person's working. They must be guided wholly by the practical result; the pounds, shillings, and pence was the great test, as far as the companies were concerned. Men might theorize for a long time without attaining a profitable result, but if the figures were given showing the strength of the liquor, the amount of fuel used, the proper cost of labour, and so on, it would throw much light on the question. He had noticed for years past, with reference to the manufacture of sulphate in the usual form, that gas companies had been much complained of for the nuisance arising from the sulphuretted hydrogen. This was one point which those who made sulphate ought to turn their attention to, so as to remove the nuisance and prevent the sulphuretted hydrogen passing into the air. Some other means beside passing it under the boiler might be adopted, and Mr. Marshall had named one which he thought might be brought to a practical issue. Mr. Goddard's paper had been an extremely valuable one, first of all because of its own excellence, and secondly from the amount of discussion to which it had given rise, and after all this was the great point—the amount of practical experience which was elicited in discussions. He had much pleasure, therefore, in proposing a vote of thanks to Mr. Goddard for his paper.

Mr. BROADBERRY seconded the motion, which was carried unanimously

This closed the business of the meeting, and the members afterwards took tea together.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.

(*Concluded from p.* 696.)

Mr. D. BRUCE PEEBLES read the following paper:—

ON A NEW SYSTEM FOR ASCERTAINING THE CONSUMPTION OF GAS IN STREET-LAMPS; SUITABLE ALSO FOR TELL-TALE PURPOSES IN PUBLIC WORKS, ETC.

A true balance and a just measure have been held in respect from time immemorial, and in all the relations of buying and selling are indispensable. The knowledge that we are being fairly dealt with, and that we have acting as an arbiter an instrument which cannot tell a lie or give a false result, leads to a feeling of confidence and satisfaction on either side, and is welcomed by all honest men, whether they be buyers or sellers.

So far as the selling and buying of gas is concerned, the gas-meter, whether wet or dry, if well made and properly looked after, leaves little to be desired, and the general absence of complaint proves that it has the confidence of both parties concerned in its use. Although occasional mistakes may be made, and occasional complaints may be met with, these only serve as exceptions to confirm the rule, and leave the feeling that there is not much to complain of.

While the meter is, as near as possible, all that can be desired as to accuracy and convenience, there are some situations where it cannot be so readily adopted as in others, and where only single lights are used, a more convenient system of estimating the gas consumption may be wished for. Let an unvarying consumption per hour at a single burner, or a given number of burners, be assured, and all we want then to get at the quantity consumed is the time the gas has been burning. Long ago many single burners were in use in houses without meters, but we should have to go a long way to find such a thing now; and almost the only cases of unregistered gas being sold occur in connection with the supply to public lamps. This has long been a question of great importance, and has often led to serious misunderstandings, although it is many years since a system was devised for arriving at a very close estimate of the average consumption of gas used in lighting the public streets.

So long ago as the year 1864, the JOURNAL OF GAS LIGHTING published the evidence of Mr. Hersey, the Superintendent of the Imperial Gas Company, whose opinion was that a meter fixed at every lamp-post would not give such an accurate result as correctly adjusted regulators. Mr. Hawksley, Mr. Barlow, and Mr. Methven also gave valuable testimony regarding the advantages to be derived from the adoption of lamp governors in connection with meters for arriving at an average consumption. Their testimony will be found in the pages of the JOURNAL, and the spread of the average meter system may be traced to their influence and authority, the result being that the principal cities and towns of the United Kingdom have adopted it with the most satisfactory results.

The usual method is to connect a wet or dry meter to a certain number of different lamps in various situations, and estimate the consumption of the whole from an average of the readings of the meters. The meters are, as a rule, sunk underground beside the lamp-post, although in some cases they are attached to the posts a little below the lanterns. Careful attention to watering is necessary with wet meters, and in winter precautions must be taken during cold weather, by the addition of spirit or glycerine, to keep the water from freezing With the dry meter there is a danger of the leather hardening by the frost, so that care must be exercised to guard against stoppage or faulty measurement through either of the above causes. I may also state that it is not an uncommon complaint amongst gas managers that the burner at the meter lamp, either through accident or otherwise, does not pass so much gas, or give so good a light, as those at the unmetered lamps. With these matters I know you are all perfectly familiar, and I mention them merely to remind you that time, care, and attention are required, in connection with lamp meters, if true results are wished for.

The accurate measurement obtained by the metallic lamp governor invented by the writer led him to consider whether the element of time could not be introduced so as to give an equally, if not more accurate result than is obtained from the use of the wet or dry gas-meter. An attempt of mine at the fulfilment of this idea I am about to describe.

About 6 feet from the base of the lamp-post a small square box is cast, which is provided with a door fitting accurately and made lock-fast. Within the square chamber a clock is placed, to which is attached a link connected to the gas-tap. On the side of the chamber opposite to the door, a small longitudinal hole is made to admit of a key being inserted to turn the stopcock, which is so arranged that when the lamplighter turns on the gas, the clock is set in motion, while the shutting of the stopcock stops the clock. The clock therefore registers the time that the gas has been burning, which being multiplied by the quantity per hour the metallic governor is set to pass, gives the number of feet consumed. The clock registers up to 10,000 hours, and the dial is read like that on an ordinary gas-meter. One of these block pillars placed at the beginning and the end of the district each lamplighter goes over would give a result closely approaching accuracy, as by adding together the indications of both clocks, and then halving them, a mean would be arrived at which would fairly indicate the average time all the lamps had been lighted. Even where meter lamps are now in use, a few of these clock lamp-posts would be serviceable as a trustworthy check on the meter indications, because the number of hours the lamps had been burning, multiplied by the quantity per hour the governors were adjusted to pass, should agree with the quantities indicated by the meters. The clock will go for 192 hours, and would require winding—the work of a few minutes—once a week in winter, and once a fortnight in summer, while at the same time a reading of the index might be taken.

This clock arrangement may be otherwise useful in registering long periods of time without trouble, and also as a tell-tale, when punctuality of attendance is wanted. In such a case the clock would be enclosed in a box, and the box placed in a position where it would require to be opened before any work could be done, and so arranged that the opening of the box would cause the clock to commence going. In order to ensure this, the keys of the premises could be placed in the box, so that nothing could be done until the box was opened. Say that the hour for commencing work be six o'clock, and that the state of the index was taken on the pre-

vious day, if punctuality was observed at the above hour, and the clock is inspected, say, at nine, it will be found that it has gone three hours; if it was opened at half-past six o'clock, it will only have gone 2½ hours, and so on.

Another purpose to which it might be readily applied would be the supplying of one, two, or any stated number of automatic governor burners to market-stands, itinerant showmen, or "cheap Jacks," in places where it might not be convenient to place meters. The number of hours the clock indicated, multiplied by the number of feet the burners were adjusted to, would give the consumption. The chief interest for ourselves, however, is its adaptation to public lamps, but I have made these suggestions as there may be cases where the clock arrangement would be useful for such purposes.

Discussion.

The PRESIDENT said Mr. Peebles's paper was one of great interest, because a gas manager ought, at the end of the financial year, to be in a position to show the loss by leakage or unaccounted-for gas. If the lamps were adjusted with the apparatus described, one obstacle to correct calculation would be got rid of. It could be ascertained exactly how much gas had been consumed in the public lamps. He was certain that if this apparatus were adopted, satisfactory results would ensue, as he thought that a certain quantity of the gas which was accredited to leakage was not the result of leakage at all, but of gas consumed in public lamps which had not been accounted for. He had had conversations on this subject with several managers, and the lighting of public lamps seemed generally to be considered a grievance. The average meter system, too, did not afford satisfaction in every quarter.

Mr. MITCHELL said it seemed to him that if lamps over a specified district were supplied with a regulator tap, the quantity of gas consumed by them would be indicated by one of the tell-tale clocks described, because it would indicate the quantity of gas which each had consumed. He knew a corporation which had had great trouble with the average meter system, because of the difficulty of maintaining all the burners of one size. This invention of Mr. Peebles would remove such difficulty.

Mr. D. M. NELSON said he had heard of this apparatus before, and had doubts about it, but the explanations afforded by Mr. Peebles removed them. He thought Mr. Peebles had taken the most common-sense view that he (Mr. Nelson) had yet heard of for the average meter system, and he had great hope that the appliance described would be shortly introduced into towns.

The PRESIDENT having proposed a hearty vote of thanks to Mr. Peebles for his paper,

Mr. PEEBLES said: I beg to thank the meeting for the vote which it has been so kind as to accord to me. As I have said before, it gives me great pleasure to exhibit any novelty to the members of the Association, in whose periodical meetings I have always taken a great interest, and I hope shall continue so to do.

Mr. NELSON: The very fact that so few remarks have followed the reading of the paper is the best argument that I know in favour of the instrument.

Mr. S. DALZIEL (Kilmarnock) then read the following paper:—

ON THE TREATMENT OF RESIDUALS.

(FIRST PAPER.)

Our worthy Secretary has put me down for a paper on residuals. I hope that he meant thereby, and that your expectations are limited to the bye-products tar and ammoniacal liquor.

I doubt not it is in the recollection of some of the older members of this Association that, in the earlier days of gas-making, these articles were a heavy drawback or drug in the conduct of gas-works. There was no market for them, and I have heard it asserted frequently that the liquor was sent down some adjacent burn in a spate, and a pit dug to bury the tar. Happily our lot has been cast in happier times, and if we choose to work them ourselves they will yield a good return, or if we prefer to sell there are many willing to give a good price. Either way residuals have become within the past 30 years an important source of income; in my own case, during the last four years, being equal from 5s. to 5s. 3½d. per ton of coal carbonized. I believe that, notwithstanding the grand discoveries which science has made, by the researches into the constitution of coal tar and its many compounds, better days are in store, and better prices still will be obtained for these articles, and that in every gas-works this will be a department to which gas shareholders will look for a fair, if not a good return for the money invested. In giving a receipt for the making of hare soup, Mrs. Glasse says the first thing is to catch your hare. Now, in many of our gas-works we have allowed the "hare" to slip through our hands, to our own detriment and expense in the purification, and what should be a source of income is the author of expense and waste, not to mention the intolerable stench that arises when a purifier is changed in works where no scrubber or washer is used.

In 1872, when I was appointed Manager, the time had come in which it was absolutely necessary that large extensions of the works should be made. The wave of prosperity that swept across the land in 1873 had begun to rise, and I may say I was caught between two Boards—the Board of Directors of the Company, and the Committee of the Corporation. The season was well advanced, and there was no time to plan, renew, or extend any part of the works. I immediately set about repairing the plant to the best of my ability, in order to get through the first winter; and here I may state that that winter I gained experience which only falls to man's lot once in his lifetime, and only to those similarly circumstanced to myself. At the end of my first year I found that in some things I was not worse than formerly, but in regard to residuals I had fallen behind. I had not done so well as I expected, and was considerably disappointed. I cannot say at this time whether it was in the return per ton of coal or a fall in the prices of residuals, but I was chagrined to find myself in the background with regard to this department. In the first year of my working I only made 16 lbs. 3½ oz. of saleable ammonia per ton of coal.

At this time I had one scrubber 20 feet high and 4 feet 3 inches wide, and had become satisfied that an additional one would be an advantage. Accordingly, in the winter of 1873–4, when I enlarged my purifiers, I added an additional scrubber, with the result that, although not finished till the new year, at the end of the season I found the make of sulphate of ammonia had increased 2½ lbs. per ton of coal carbonized, although the best part of the season was past before the scrubber was put into operation. In the following year (1874–5) I derived the full benefit from this extension, by selling 21½ lbs. of sulphate per ton of coal. You will observe that the additional scrubber gave me 5 lbs. of sulphate of ammonia per ton of coal more in the year 1875 than in 1873.

During the winter of 1874–5 I was very much tantalized by finding that my first scrubber was not behaving in the manner a good scrubber ought to do. I found that in running it off it had been imbibing a goodly portion of tar and the lighter oils, the condensers apparently having gone off or shirked their duty on finding themselves overwrought, and had apportioned a part of their work to scrubber No. 1, with the effect that although scrubber No. 2 was always up to the mark, when I passed the water of No. 2 into No. 1, I could not get No. 1 to increase more than a degree in strength, although it had the first of the gas; thus convincing me that, from the tarry nature of the water, the condensers had not cooling surface enough to perform the work required of them. What follows will show how essential it is that every piece of apparatus, in a gas-works at least, should be quite equal to, and more than sufficient for the work required of it. In the autumn of 1875 I doubled my condensing power, the result being that at the end of the season I had made of good saleable sulphate of ammonia 24½ lbs. per ton of coal, the sale for the year being 49 tons 12 cwt. from 4534 tons of coal carbonized; and from that time to the present—that is, for the past four years—my make of sulphate has ranged from 26½ lbs. to 27 lbs. 3 oz. sold per ton of coal.

I think it is Mr. R. H. Patterson who makes the remark, that the manufacture of gas begins in the retort and ends in the hydraulic. In addition to this I would say that our bye-products are also made there, and are influenced very materially by the heat at which the coals are carbonized in the retorts, and I am inclined to hold the opinion that if the heats in our retorts are raised beyond a bright orange, it will result in reducing the illuminating power of the gas. I grant that a larger volume of gas is made per ton of coal, but it is at the expense of the tar, and also of the ammoniacal liquor, which I consider is deteriorated in quality, the tendency being to convert ammonia into cyanogen gas. At the same time I believe in Mr. Newbigging's motto: "Keep up the heats;" and I am afraid some of us would work at higher heats if we could have them. At the same time I am quite satisfied that heat carried beyond a certain point does not result in additional profit, but perhaps in positive loss, on account of the extra wear and tear of retorts, as well as a poorer return for bye-products. I remember a year ago comparing notes with other works, one in particular which is managed by one of the cleverest men in the profession, and stands high in general working, and I found that though I had not sold nearly so much gas per ton of coal, the income from bye-products fully met, and a little more, the difference; that is, valuing the number of thousand cubic feet of gas sold per ton, and the income derived from the bye-products, when I summed up the gains from both together, comparing the value of the coals, the gain was on my side; but possibly, if full details could have been obtained, it might not have resulted so favourably for me. In works where the bye-products are worked up, it is not so material what the heats employed may be, but every manager should do his best for both departments; and then he has this satisfaction, that should anything be lost in the retort-house, it is recovered in the chemical works.

I must, however, not be misunderstood, for, as managers of gas-works, our primary duty is to manufacture gas—get as much as we can of it per ton of coal, and of such a quality as will satisfy even the most fastidious consumers. After we have made the gas in the retorts, and it has taken its first plunge bath into the hydraulic main, purification begins; the gas begins to part with its tar and liquor. Pushing on to the condenser, this process is further carried on, and in my condensers, which are battery condensers, I always have in addition to tar and water a large deposit of carbonate of ammonia, so much so that in mid-winter I have to wash the condensers with warm water sometimes twice a week, to prevent choking; in fact, I have to watch them daily to keep things moving right, and I am considering whether it would not be advisable to have a very small jet of steam entering with the gas into the condenser, to supply moisture to prevent the carbonate of ammonia from crystallizing. Presuming that the condensers are doing their duty, and the gas reaches the scrubber free from tar, the gas is just in the condition in which scrubbing is effected at the moment it enters the scrubber, the attractive power of the water for ammonia being so great that it instantly seizes and holds it in solution; it is what the German, in describing "likings and dislikings," calls "*Lust und Unlust*," the attraction for each other being so great that they go together with a rush. Water at 60° will take up as much as 500 times its own bulk; that is, 1 gallon of water will take up 500 gallons of ammonia. So here is an agent that costs nothing, which was once thrown away, a willing servant ready to assist us in the work of purification, and adding considerably to our revenue. The mixture of water and ammonia is not a new chemical compound, neither is it chemical affinity; but it is a mechanical attraction the one has for the other, and the colder the water the more ammonia will it hold in solution; thus in winter, when it is most needful, the scrubbers are in the best condition to perform their work. At this point not only is ammonia taken up, but also, it is said, "carbonic acid, hydrosulphuric acid, hydrocyanic acid, and sulphocyanic acid, and, in addition to these, ammoniacal liquor, which contains hydrochloric acid." These water takes up readily, and this accounts for the fact that the liquor of our gas-works is denser than pure ammonia water. Supposing water to be 1000, a solution of strong ammoniacal liquor is about 870, whereas gas-works liquor at 5° Twaddel would be 1025. The compounds before mentioned add to the specific gravity of the liquor, but not always to its commercial value; still, in my own working, I have found that when proper attention has been given to the stills, &c., the results have always been in proportion to the strength of the liquor.

I have two scrubbers, which I will call No. 1 and No. 2; No. 1 being the first, No. 2 the second to which the gas passes. No. 2 I will fill up with clean water, and, when it has become saturated up to 3° or 3½° Twaddel, I run off No. 1, which by this time has gone up to 7° or 8° at the most—that is, 14 to 16 oz. liquor—and the weak liquor of No. 2 I run into No. 1, and refill No. 2 with clean water again, so that the gas has nearly always fresh water to come in contact with. The strength of the condenser liquor I have found as high as 6° and as low as 2½°, or 5 oz. liquor; and the average, when the liquor of No. 1 scrubber is run off, brings it up to 5° and 5½°; that is, that the specific gravity of the liquor which I fill into my boiler is from 1025 to 1030, and on a rare occasion it rose to 1036. This has occurred when I have been steaming out the condensers or the receiving tar-tanks. The crystals of ammonia are dissolved, and run on to the tar-well, the liquor on these occasions sometimes ranging over 6° Twaddel. There is another source of very strong liquor—namely, from the tar still. One would be disposed to think that, from the nature of green tar, and the appearance of it after standing for some time, there would be little water in it; but in a boiling of green tar of say 2400 gallons, I get from 90 to 100 gallons of naphtha, about 400 gallons of ammoniacal liquor, and 1900 gallons of boiled tar. This liquor that separates from the tar at the beginning of the distillation is as high as 14° to 15° Twaddel, coming down to water at the close; the average strength of the liquor in green tar is from 7° to 8° Twaddel, or 14 to 16 oz. liquor. The density of the liquor is the cause why it does not separate from the green tar, the specific gravity of liquor being so near to it that it is not light enough to come to the top surface of the tar. Green tar, therefore, is valuable not only for itself, but also for the strong liquor which it holds in suspension, and which is returned during the distillation of the green tar to the tar-well.

What I have been saying has been chiefly in regard to the ammoniacal liquor. In reference to tar, in order to cleanse the gas from this substance, condensation only is required; and, as I have shown, when I enlarged my condensers, the gas having been cleansed or purified from tar, the operations of the scrubbers and the purifiers also were more active, and did better the work that was assigned to them. Hence, as I have already remarked, the necessity of having all our apparatus quite, and even more than equal to the work required of them, otherwise if

there is a lack of condensing power, there is a loss of a return for tar, also for ammonia. If the scrubber has to do the work of a condenser, then the purifiers have more to do, so that more lime is used than would be needful if all the apparatus were up to the point in size, and doing their work efficiently. This is a matter which all managers should try to impress upon directors of companies and committees of corporations—viz., that judicious expenditure on plant always meets a sure reward in the shape of 10 per cent. dividends on the capital employed. The liberal man deviseth liberal things. It is a great fallacy and false economy that hampers a manager in any one portion of his plant. In reference to this particular article ammonia, each portion paid itself in the first eighteen months; and I would advise all managers situated as I was myself to induce their directors to put their hands into their pocket and enlarge their condensers, or put down an additional scrubber. The increased dividend jingling in their pockets at the end of the first year would, I hope, enlarge their hearts, and cause them to let the manager also, who has the oversight of these matters, share in their prosperity.

Discussion.

The PRESIDENT said he should like to know from Mr. Dalziel whether it would be profitable for small gas-works to utilize their own residual products, and what additional capital would be necessary to enable them to do so. If this point were made clear, he had no doubt that many corporations and gas companies would begin at once to work up residuals. Every one was aware that a large sum was annually expended for these residuals in the shape of carriage alone; and if it paid others to do this—he did not think there could be any doubt on this point—he did not see how it should not pay companies and corporations. The only question with him was what annual make of gas would be necessary to render such works profitable.

Mr. NIVEN considered that the chemistry of the residuals had been exceedingly well brought out in the paper. In regard to the commercial question raised by the President, it was, he thought, for each one to decide for himself. He understood that the paper was only preparatory to another, in which he had no doubt Mr. Dalziel would give all particulars from a commercial point of view. He would, therefore, not anticipate these particulars by asking questions.

Mr. DALZIEL said there was one thing he wished to bring under the notice of the meeting—namely, that some gas-works had not the necessary power to propel machinery; but now that gas-engines were so handy he should say that every manager ought to have a scrubber. He was certain if those who had not such mechanical power would only introduce a gas-engine, they would nearly double their make of ammoniacal liquor. Here alone there was a large return from a substance which ought to be taken out of the gas before it went to the purifiers. He stated that he meant to give a paper on this subject—bringing out further details—at the next meeting.

Mr. M'GILCHRIST briefly explained a new photometer dial of his arranging, to simplify the testing of gas.

Mr. MITCHELL then moved a vote of thanks to Mr. Carlow for the way in which he had discharged his duties as President. No exertion had, he said, been wanting on Mr. Carlow's part to make the meeting attractive and instructive.

The PRESIDENT, in acknowledging the compliment, said if he had done anything to further the interests of the Association he had his recompense in seeing so many kind faces around him that day. He concluded by moving a vote of thanks to the Secretary, Mr. Johnstone, for the way in which he had discharged the duties of his office.

Votes of thanks were also accorded to the authors of the papers, and to the various firms who had sent articles for exhibition.

On the motion of Mr. NIVEN, seconded by Mr. RENFREW, it was agreed to hold the next meeting of the Association in Glasgow.

Mr. MITCHELL moved a vote of thanks to the Magistrates of Port-Glasgow for the use of the hall in which the meeting had been held; and this was agreed to.

The PRESIDENT said he had a letter from Mr. Levi Monk, of Lanark, in which that gentleman wished the members of the Association a long farewell. Mr. Monk stated that he was sorry he could not attend the meeting. He (the President) might say that Mr. Monk had been a very valued member of the Association, and he thought that the least they could do would be to wish him prosperity, comfort, and happiness in his new sphere.

Mr. NELSON asked whether the statistical report of the Association was to be continued.

The PRESIDENT said that this matter had been once or twice under the consideration of the Committee, and it came to be a question whether the report should be issued yearly, or once every two years. Last year it was not issued till November or December, and by that time this year the Committee would be able to decide whether it should appear.

In the course of the day the members of the Association visited the Port-Glasgow Gas-Works, and were shown over the premises by the President. Through the kindness of Provost Somerville they were entertained to lunch, after which several appropriate toasts were given. In the afternoon, at the conclusion of the business, the members dined together, Mr. Carlow in the chair, and Mr. Dalziel discharging the duties of croupier. A happy evening was spent.

DRY WEATHER ACROSS THE ATLANTIC.

(FROM OUR AMERICAN CORRESPONDENT.)

The summer just ended has been one of unusual dryness in America, and the fall has failed to bring the hoped-for relief. All through the summer the water companies throughout the eastern and middle portion of the United States, and especially the latter, have been living, so to speak, from hand to mouth. The companies and corporations which draw their supply from various sources, and have abundant storeage capacity have had, comparatively, little fear, estimating that they could pull through till the autumnal rains made the streams flow with their accustomed fulness; while the purveyors of water who have only one or two means of obtaining a supply, and possessing moreover but a scanty reserve, have resorted to various expedients to obtain a temporary supply, feeling confident that the fall would bring the desired relief. Unfortunately the transition from summer to autumn has brought little change—a dry summer is apparently to be followed by a dry fall. The state of affairs in many cities is thus very serious.

In Brooklyn, N.Y., the authorities are sinking a number of large wells, which it is hoped will so increase the present supply as to meet the wants of the city. In the meantime, much inconvenience and loss are experienced, the quantity of water sent out not being equal to the demand. Paterson, N.J., is suffering greatly from the drought. The Water Company of that city obtain their supply from the Passaic River, which is controlled at this point by the "Society for the Promotion of Useful Manufactures"—a Society founded by Alexander Hamilton, and whose charter gives them the exclusive use of the Passaic River above the Falls. Consequently the river is lined with factories of all descriptions, which utilize the swift-flowing current to produce their motive power. As in some dry seasons the supply of water failed them, a dam was built above the race-way, so that the Society might have at all times an abundant reserve at their disposal. When the water-works were built the Company were forced to locate below the factories, and thus obtain their supply from what flowed over the dam. The drought has dried up the Passaic River, so the Society have been compelled to draw from their reserve; and, no rain coming, this surplus has become so far exhausted that the factories have had to work only half time. Some, however, have closed "for want of water," as the signs on the doors state. The Water Company having their reserve reservoir only part full, determined to keep the water for use in case of fire. Thus the supply to the town has been entirely cut off, necessitating the close of nearly all the factories throughout the city, and the labourers thrown out of employment peddle water to the citizens at from 1 to 2 cents a gallon, many of them carting the water from considerable distances. A slight rain on Oct. 17 gave temporary relief, but the aspect of affairs is serious, especially as many other cities get their water from the Passaic *below* Paterson.

The effects of the drought in these cities are not exceptional cases, but examples of many others. Even in New York City, with its many sources of supply, the Commissioner of Public Works issued an order on Oct. 18, prohibiting the use of water for sprinkling the streets.

AMERICAN GASLIGHT ASSOCIATION.

[From the "Official Report" in the *American Gaslight Journal.*]

The Eighth Annual Meeting of this Association was held at Chicago, Ill., on Wednesday, Thursday, and Friday, the 13th, 14th, and 15th ult.—Mr. W. H. PRICE, of Cleveland, Ohio, the President, in the chair.

The minutes of the previous meeting having been taken as read, the names of fourteen applicants for membership were read; and, on ballot, the whole of them were elected.

THE PRESIDENT'S ADDRESS.

The PRESIDENT, in the course of his opening address, said: The year that has passed since our last annual meeting has not, so far as I am aware, been distinguished by any remarkable changes in the condition of the gas-lighting industry in either our own country or in foreign lands. There has been, however, a steady—in some instances a large decline in the price of gas, and an equally steady advance in measures demanded to meet the new conditions.

In regard to the first point, I have been for some time a believer in the doctrine that our companies should make their money—as all large manufacturing industries in the long run make theirs—by large sales at a small percentage of profit. Gas is a comfort, a luxury, which we should aim to bring as nearly as possible within the reach of all. In this matter our interest runs in the same direction with an enlightened public spirit. Our only real competitor is petroleum, and that, at the low price prevailing for the last few years, and by the use of improved lamps, is a *real* competitor. Yet in our larger towns, where a liberal consumption may be secured, if the gas-works are in the best condition, if labour be judiciously applied, if good material be used, if the expense of distributing be kept at a low point, and if stockholders are satisfied with moderate dividends upon genuine unwatered stock, gas may be sold at a price which will make the margin of cost between good gas light and poor oil light very narrow.

With your leave, I will indicate some lines in which a steady advance in the right direction has been made during the past year.

It is obvious that managers of gas-works must, ere long, adopt improved furnaces. The old furnaces, in which 40 to 50 per cent. of the coke produced is consumed in carbonizing, must be discarded, and some form of the many now claiming attention must take their place. If there be a furnace, as I am confident there is, which will require not more than 25 per cent., perhaps not more than 15 per cent., of the coke made, which will require much less labour in firing and clinkering, before which the labourer can work in comparative comfort, and, above all, which will much more effectually heat the bench, making every retort equally useful from end to end, that furnace must be adopted. I do not undertake to indicate which is the better; indeed, I do not know; but that which is best must be searched out and must be introduced, and the discussions of the past year have helped a good deal in this direction.

One reason why gas can be sold so very low in the Old World, especially in the British Isles, is the fact that the saving and utilizing of residual products have been there carried to a high degree of perfection. One of those residual products is ammonia. In this country that product has been, and is now largely wasted. But it is a valuable product. In order to secure a successful working of the ammoniacal liquor produced in your works, you must have such scrubbing apparatus that you can take from your gas (as it passes) nearly all its ammonia, and save it in a concentrated form. Some scrubbers do this, and some do not. The truth as to the best scrubber has been slowly evolving for some years, and this matter has made considerable progress during the past year.

I think I am correct in saying that 15 years ago most gas managers were content with a product of from 4·25 to 4·50 cubic feet per lb. of coal carbonized, and as a matter of fact the former figure was more generally the limit than the latter. Now our average of 5 feet is not considered extraordinary, and a few obtain a much larger product than this. I have lately visited a works in which I was assured that more than an average of 6 feet was obtained, and I was credulous enough to believe the statement. However this may be, it is well settled that 5 feet and more may be made from every lb. of good coal carbonized in your works. Time, quantity, heats, and enricher—all these items must be considered and adjusted in determining the best process for obtaining the largest yield of good gas. Poor quality will not be tolerated. The past year has contributed something towards a solution of the question: What is the best system of carbonizing?

A year ago I ventured to call your attention to machinery invented by Mr. Ross, and in use in the works of the Cincinnati Gaslight and Coke Company, and I beg leave to again call your attention to that machinery. I have a good deal of confidence in it, and I understand that much abler men than I am have endorsed it, and that it is likely to have a thorough trial in one of the largest works in America. I only ask you to examine it for yourselves. If the machinery is a success, the inventor has conferred a great benefit upon the gas fraternity.

Perhaps no article of domestic comfort is more injudiciously and more wastefully used than that which you furnish, and no department of effort deserves more attention than this—the introduction of the best burners, and in our streets the best lanterns. You may visit the house of one neighbour, and you will find the most perfect illumination; and you will find in the dwelling of another cheerless, half-lighted rooms, and yet perhaps the latter is consuming more gas than the former. The difference may be wholly caused by the burners employed. During the past few years, and especially the one just passed, much has been written and much has been done to remedy this difficulty. And this remark will apply to street lanterns. Some are adapted to their work, and many are not. Too often the selection of the proper lantern is left to some chairman or some committee stupidly ignorant or indifferent. Sometimes the coaxing blandishments or the insinuating bribe of some scheming manufacturer of

a "new and improved lantern" wins the day, and the wayfaring pedestrian curses good gas and denounces it as poor, when the whole difficulty lies in the burner used for its combustion, or the instrument used for its protection and diffusion, or both.

Probably greater advance has been made during the last year in promoting the use of gas in the kitchen, the laundry, and the engine-room, than in any preceding year. I think this must be certainly true in our own country. In towns where gas is sold at a low rate, a great many cooking and laundry stoves have been placed, and usually with much satisfaction to the parties using them. This good work will go forward. So also the introduction of gas-engines for many purposes is making rapid advance, and will progress more rapidly in the future. The importance of promoting these various forms of day consumption is obvious to every gasman, and I need not dilate upon it here.

Thus, gentlemen, I have hurriedly referred to the march of improvement in your department of labour, as it appears from my standpoint. There might be much said upon many points of interest, as, for example, water gas, electric lighting, &c.; but these introductory remarks have already been extended quite far enough—perhaps too far, for I am sensible that I have said nothing new. It is now for you, gentlemen, to make this convocation eminently profitable and interesting.

The Report of the Executive Committee was then read. It detailed the titles of the papers to be read at the meeting; and recommended, among other things: That the proposal to change the time of the annual meeting from October to May should be considered; that a Committee should be appointed "to prepare a table of standards for the use of the Association, to the end that all papers presented, and discussions had on such papers, may be based upon a common standard of results and comparisons;" and that the salary of the Secretary and Treasurer of the Association should be fixed at 300 dols. per annum, with an allowance not exceeding 100 dols. for expenses during attendance at meetings.

The Treasurer's report, which was also submitted, showed that the receipts during the past year (including the balance in hand at October, 1879) amounted to 2196 dols. 35 cents. The disbursements totaled to 1082 dols. 81 cents; increasing the balance in hand to 1113 dols. 54 cents.

The Committee on Standard Test Burners—consisting of Mr. C. Nettleton, Major Dresser, and Mr. Sherman—and the Committee on Unaccounted-for Gas—composed of Mr. A. C. Wood and Mr. C. A. White—were not prepared with definite reports, and so were re-appointed for another year.

After the transaction of some routine business in connection with the affairs of the Association, the report of the Executive Committee mentioned above came up for consideration. The proposal to alter the time of meeting from October to May was, after much discussion, adjourned till the following day, so as to allow the members time to talk the matter over among themselves. The other two recommendations of the Committee, referred to, were adopted.

The adjournment for luncheon then took place; and on the re-assembling of the members, the following list was read of

OFFICE BEARERS FOR 1880-81.

President—Mr. W. H. Price.

Vice-Presidents.—Messrs. A. Hickenlooper, T. Forstall, and W. A. Stedman.

Secretary and Treasurer.—Mr. W. H. White.

Finance Committee.—Messrs. J. S. Chambers, A. B. Slater, and G. S. Hookey.

Executive Committee.—Messrs. H. Cartwright, F. C. Sherman, A. C. Wood, P. T. Burtis, T. Littlehales, and S. Prichitt.

The reading of papers was then commenced.

(To be continued.)

METROPOLIS WATER SUPPLY.

The Registrar-General publishes the following table in reference to the Water Supply of London during October. According to returns furnished to him by the Metropolitan Water Companies, 140,961,821 gallons, or 640,454 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily, or 236 gallons (107·2 decalitres), rather more than a *ton* by weight, to each house, and 33·2 gallons (15·1 decalitres) to each person, against 33·2 gallons during October, 1879.

Companies.	Number of Houses, &c., supplied in Oct., 1879.	Number of Houses, &c., supplied in Oct., 1880.	Aver. Daily Supply of Water in Gallons* during Oct., 1879.	Aver. Daily Supply of Water in Gallons* during Oct., 1880.
Total supply	571,608	597,353	134,868,556	140,961,821
From Thames	273,473	286,548	63,879,547	71,284,299
„ Lea and other Sources	298,135	310,805	65,989,009	69,677,522
THAMES.				
Chelsea	29,945	30,375	8,424,200	8,645,700
West Middlesex	53,312	55,846	10,316,567	10,811,269
Southwark and Vauxhall	88,099	91,942	24,469,462	24,487,126
Grand Junction	39,648	42,828	11,792,418	12,378,504
Lambeth	62,469	65,557	13,876,900	14,961,700
LEA AND OTHER SOURCES.				
New River	129,271	132,019	28,115,000	26,733,000
East London	120,459	128,015	29,852,000	34,624,000
Kent	48,405	50,771	8,024,009	8,320,522

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for October, 1880, as compared with that for the corresponding month of 1879, shows an increase of 25,745 houses, and of 6,093,265 gallons of water supplied daily.

The following is Dr. Frankland's report of his analyses of the water supplied to London during October:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Colne Valley, 1·3; Kent, 1·6; Tottenham, 1·7; New River, 4·6; Chelsea, 5·3; East London, 6·2; Grand Junction, 6·6; Lambeth, 7·3; Southwark, 7·9; West Middlesex, 8·4. The water drawn from the Thames was of inferior quality even to that supplied during the month of September, and, excepting that of the Chelsea Company, was unfit for dietetic purposes. The water of the Grand Junction and Southwark Companies was alone efficiently filtered. Of the water drawn from the Lea, that distributed by the East London Company was slightly turbid, and little better than Thames water. That sent out by the New River Company was of slightly better quality than the Chelsea Company's water, and was efficiently filtered before delivery. The deep-well water supplied by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was of its usual excellent quality for dietetic purposes, and the Colne Valley Company's water was also soft, and therefore well suited for washing. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; New River, clear and pale yellow; Southwark and Grand Junction, clear and yellow; Chelsea and East London, slightly turbid and pale yellow; West Middlesex and Lambeth, slightly turbid and yellow."

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matter.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames—								
Chelsea	29·48	·268	·042	0	·149	·191	1·5	20·6
West Middlesex	28·90	·447	·047	0	·162	·209	1·4	20·3
Southwark	32·10	·410	·056	·002	·182	·239	1·6	21·5
Grand Junction	30·72	·325	·062	0	·190	·252	1·5	21·2
Lambeth	31·84	·393	·040	0	·204	·244	1·5	21·5
Lea—								
New River	29·14	·227	·042	·001	·216	·259	1·6	21·8
East London	28·40	·326	·039	0	·135	·174	1·7	20·6
Deep wells—Kent	42·32	·074	·019	0	·352	·371	2·3	27·8
Outer Circle.								
Colne Valley	12·86	·058	·019	·004	·334	·356	1·5	6·1
Tottenham Local Board	40·56	·087	·013	·070	0	·073	2·9	25·7
Corporation of Birmingham*	32·70	·340	·049	·002	·154	·204	1·5	22·7
Corporation of Glasgow†	2·80	·127	·013	0	·007	·020	0·58	0·95

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

ODESSA WATER-WORKS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Wednesday, at the Terminus Hotel, Cannon Street—Sir FRANCIS S. HEAD, Bart., in the chair.

The SECRETARY (Mr. Emanuel Allen) read the notice convening the meeting, and the Directors report was taken as read. It stated, *inter alia*, that the water-rents had yielded £23,673 for the half year ending the 30th of June last, as against £22,843 and £17,985 for the same periods respectively of 1879 and 1878; and there were a total net receipts of £25,002, for last half year, against £24,249 in the corresponding period of 1879. The expenditure at Odessa had been £12,902, and in London £1414, against £11,350 and £1977 respectively in the same half of 1879.

The CHAIRMAN, in moving the adoption of the report, said the causes of the apparent increase in the working expenses of the past half year, as compared with the corresponding period last year, were explained generally in the report. Having amplified these details, and accounted for £994 of the increase, he observed that a further sum of £781 had been spent in additional coal, caused by the larger supply of water required by the town. This water, however, was paid for, so the Company could not complain. The only item of increase was the law expenses, which amounted to £138 more than before. With regard to the severity of the winter at Odessa, which caused, as the report explained, so much of the increase in the working expenses, the Shareholders might judge how excessive it was when he stated that the frost reached services 4 feet under the ground, and several of them were frozen, and had to be closed for many weeks. The street mains, too, were in many cases frozen. Such a winter had not been seen for 30 years. The value of the rouble had somewhat improved, which gave the Company a better balance on the whole than they would otherwise have had; but he was sorry to say that this improvement had not continued. One of the points on which the Directors had to complain was that while the Railway Companies were allowed to vary their fares according to the fluctuation of the rouble, this Company was denied that privilege; and the consequence was that the rates which were fixed for them when the rouble was worth its full value, 2s. 8d., were still maintained now that it was worth only 2s. He had mentioned on previous occasions the importance to the Company of the sewers being completed and connected with the houses, as each house would then require a considerable quantity of water to flush the drains; and this was also necessary for the health of the inhabitants. From the 24th of July to the 8th of October the average death-rate was 41 per 1000, and in August it was 55 per 1000. This very high death-rate was entirely owing to the want of sanitary arrangements, which should be carried out in the public interest, as well as in that of the Company. He was, however, happy to say that some progress was being made in the matter, although it was not so rapid as the Directors could wish. After quoting from recent reports of the Manager, to show the progress that was being made in this matter and the condition of the city, he observed that the city itself was progressing steadily in size and importance, and the wants of the inhabitants were consequently becoming greater every year. The Company must hope to benefit—as, in fact, they did—from this improvement. On the 30th of June last their receipts were about 12,000 roubles under the guaranteed amount; by the end of September they were only 5000 roubles under it; and this had since been converted into a surplus of 9000 roubles by the payment of an old account. The Company were, therefore, making as much progress as they could expect, under the circumstances in which they were placed; but, as he had repeatedly said, until they obtained an alteration in the law they would do no good, for he looked on any arrangement with the Municipality as quite out of the question. The Company's claim on the Imperial Government for 71,500 roubles for water supplied to the Imperial garrison at Odessa in the last 5½ years had not yet been met; but a fresh representation on the subject had been addressed to the Government, through the present Russian Ambassador, Prince Lobanoff, who was better acquainted than most Russians with the Company's affairs; and on Monday last he (the Chairman) received an answer to the effect that the Foreign Minister at St. Petersburg had communicated the claim of the Company to the War Minister, and that the reply of the latter was awaited. He had recently had some conversation with Lord Dufferin, the Ambassador at St. Petersburg, and if it was in his lordship's power to assist the Company he believed they might rely on his sympathy. The Board were doing the best they could under very difficult circumstances.

Sir ARTHUR T. F. CLAY, Bart., having seconded the motion, a discussion ensued, in the course of which the Directors were urged to show a conciliatory spirit towards the Russian authorities. It was suggested that one of them should go to St. Petersburg, and appeal at the "fountain

head" for redress. It was also contended that the concession ought never to have been accepted, as it was all in favour of the consumers, and being only for 49 years was not sufficiently long, considering the money that had been expended.

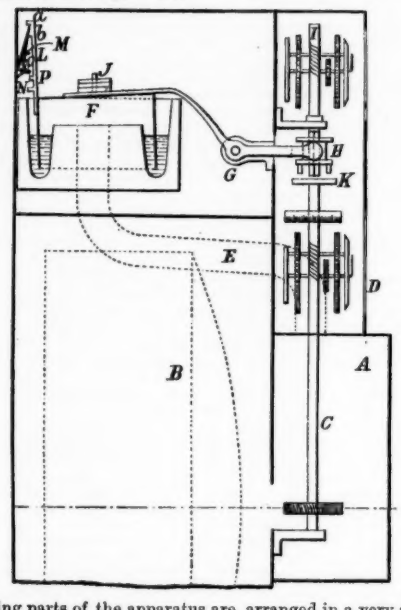
The CHAIRMAN, in reply to questions and remarks, stated that the item of "sundry debtors" related to debtors from whom they hoped eventually to recover payment; really bad debts were written off. The "expenditure in suspense" was a very old item in connection with the Company's lawsuit with the concessionaires, Messrs. Schwaben; and that reminded him that they were taking what steps they could to recover as much as they could get. No time had been fixed for payment on the deferred warrants; the Directors were obliged to use their revenue to meet debentures not renewed. Any action they took as to disposing of their undertaking to the Municipality of Odessa would simply depreciate their property, and do no good. They would be glad to dispose of it on fair terms. He had no doubt that any member of the Board would be received with every attention at St. Petersburg, but he had great reason to believe that at the present moment such a mission as suggested would do no practical good. About 18 months ago the Board sent out Colonel R. Keatinge on a special mission, and he was courteously received, but did very little good, although he had strong letters of introduction, among others one from Count Schouvaloff. Their remedy was in legislation, and he was by no means without hope that they would obtain it from the Imperial Government.

The report was unanimously adopted, and the proceedings terminated with a vote of thanks to the Chairman and Directors.

A HIGH AND LOW PRESSURE METER.

One of the novelties shown at the Special Exhibition of Gas Apparatus recently opened in Brussels is a double gas-meter designed by M. Wybrauw, one of the Engineers of the Brussels Municipal Gas-Works. The meter is constructed to register on separate dials the quantity of gas consumed at different pressures; and it is specially serviceable to those consumers—manufacturers, for example—who burn large quantities of gas in the daytime, and to whom in some places abroad a reduction is made in the price of gas consumed under these conditions.

The apparatus consists of an ordinary gas-meter, but instead of the consumption being recorded upon one dial only, it may, when required, be registered upon two, which are placed one above the other. The upper dial indicates the quantity of gas consumed at high pressure, and the lower one shows the total consumption; it is therefore evident that the difference between these two numbers will be the quantity of gas that has passed through the meter at low pressure.



The working parts of the apparatus are arranged in a very simple way, as shown by the above diagram. The valve-box, A, is of the ordinary kind. The drum, B, in revolving, communicates a rotatory motion to a vertical rod, C, which, as in ordinary meters, sets in motion the hands of the lower dial, D—that indicating the total consumption. A small pipe, E, passes from the upper part of the valve-box to a rectangular reservoir, F, placed at the back part of the meter, and upon the cylindrical case containing the drum. This reservoir is sealed by the vessel which dips into it, and is covered with a leather or india-rubber lid, that falls or rises according as the pressure of the gas is low or high. This lid is attached to the arm of a lever, the fulcrum of which, G, is fixed close to the inner case of the dial-box. The arm of the lever on the other side of the fulcrum ends in a fork, that clutches and gives motion to a coupling piece, H, capable of sliding along the upper vertical rod, I, which exactly corresponds with the lower one, and actuates the dial indicating the consumption of gas at high pressure.

Supposing the gas to be at the usual day pressure, some small weights, J, placed upon the rectangular vessel, keep it down as long as such pressure lasts; consequently, the further arm of the lever being raised, the connection between the two rods is broken, and the lower dial only is in action. When the night pressure is put on, the rectangular vessel rises, the coupling piece, H, descends, and a small horizontal rod, K, fixed upon the lower vertical rod, is clutched by the teeth of the coupling piece, and thereupon both dials are brought into action.

For convenience of description it has been assumed that the pressure of the gas is high during the evening and low in the daytime; but the meter is so constructed that it may be employed equally well whether the evening pressure be greater, equal to, or below that given in the daytime. The coupling arrangement works uninterruptedly during an entire evening, whatever may be the variations in the pressure. The apparatus is constructed to act with a certain fixed day pressure on the mains. For this purpose the rectangular vessel carries upon it a small notched rod, L. When the night pressure is on, the pawl, M, does not rest in the notch *a*, as shown in the drawing, but in *b*. If the pressure drops, the vessel cannot descend, and the two dials continue to register notwithstanding. When the period expires during which the night pressure is given, an additional 4-10ths pressure is put on at the works; the rectangular vessel then rises, the notch, N, raises the small arm, O, of the pawl, which moves backward towards the case of the meter. When the vessel descends, a second notch, P, which is smaller than the other, causes the pawl to fall again into its former position.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday*.

A tradition has long prevailed in Scotland, and has been handed down from father to son, that Edinburgh is the best-lighted city in the United Kingdom; but when actual fact is inquired into, the tradition melts into "thin air." There may have been a time when, comparatively speaking, Edinburgh was regarded as superior to other cities in respect of public lighting, but this was in the past. Since that period other towns and cities have advanced; but Edinburgh has remained stationary, or, perhaps, to use an Hibernianism, has progressed backwards. No doubt she has succeeded in discarding the old cocktail burner, and in this respect she is ahead of one or two towns in her immediate neighbourhood; but she has much to do in the way of improvement ere she can hope to compare herself with other cities. This state of affairs is greatly to be regretted, both on account of the inhabitants themselves and of those crowds of tourists who, at almost every season of the year, visit the "grey Metropolis of the North," and who are apt to receive wrong impressions of the city after sunset. There is no reason why Edinburgh should not be better lighted, except that those in power may be of opinion that a penny saved is a penny gained. The supposition which may not unnaturally arise, that the material supplied by the two Companies is faulty or bad, must be guarded against. The gas is uncommonly pure, and of a high standard of illuminating power; but all the good results which ought to flow from such an excellent supply are thoroughly neutralized by the antiquated methods under which the gas is consumed in our public lamps. For the information of those who are not intimately acquainted with Edinburgh, it may be stated that the city possesses one single flat-flame lamp of the Bray type, and that the Edinburgh Gas Company exhibit at the entrance to their premises two of Sugg's small Argands. Any one looking at these lamps cannot but feel the immense power which they have over existing lamps, nor can any one be so phlegmatic as to be insensible of the additional beauty which a row of such lights would lend to Princes Street after dark. It is not, however, so much to the general introduction of these larger and improved lanterns to all our thoroughfares that I would point, as to the necessity of overhauling existing lamps in back streets and out-of-the-way places, where certainly the traffic is not heavy, but where, nevertheless, the comfort and safety of pedestrians must be attended to. The burner in general use on the streets is the iron union. With proper attention these jets no doubt afford a good light; but when the upper surface gets oxidized, and the small apertures get stopped up, the injury to the flame is all too manifest. This is a condition which largely prevails, and when there are added governors, the diaphragms of which have become hardened and stiffened by the absorption of gaseous compounds, the evil is magnified tenfold. From many of these lamps the veriest peep of light is visible, and looking at such a production, one is inclined to sigh for the days of the old oil lamp. In view of the smallness of the light, I have heard the question urged over and over again by Managers from the South: "Why continue to make gas of such a high illuminating power, and squeeze the soul out of it at the point of ignition? Why not make gas of a lower illuminating power from a poorer coal, and burn more of it through jets of larger bore?" The queries are very pertinent, and not without some degree of force; but in Scotland there is a very strong prejudice against lowering our high photometrical standard, and so long as we have the rich cannels and the means of producing high-class gas, it is better to keep up the standard, and rather adjust the fittings so as to give as nearly as possible complete combustion. In Edinburgh attention cannot be given too soon to the defective state of the public lamps. Mutterings have been heard over and over again of the possibility of electricity coming into use in our large squares and open spaces. Owing to the peculiarity of its position, Edinburgh is perhaps one of the best-adapted places in the kingdom for such electrical displays, and if advantage were taken of the present state of affairs, the electric light might do much to curtail the use of gas publicly. The possibility of this becoming *un fait accompli* ought, therefore, to rouse those responsible for the lighting of the streets to a sense of their duty. There is always danger when the lamps are not trimmed.

The Perth Gas Commissioners met on Tuesday last, when it was reported that the quantity of gas made during the month of October was 656,500 cubic feet more than the quantity made in the corresponding month of last year. The average illuminating power during the month was 26·6 candles.

The people of Huntly are somewhat exercised as to the propriety of lighting their streets in a better manner than at present; but it seems that owing to the construction of the lamps a flat-flame cannot be substituted for the present "round-flame" burners; therefore the reform which is so greatly desired cannot be introduced.

It is now about 18 months since the North British Railway Company transferred the gas-works of Burntisland to the Town Council, and since then the Company have become consumers from the town. When the transfer took place, they retained their meters; and now the Council claim rent for them, but the Company refuse to pay, maintaining that the meters are their property. The Council brought the matter under the notice of the Sheriff, who, on Wednesday, held that the Railway Company, in handing over the works to the town, handed over all the plant, and these meters being part of the whole, they belonged to the town. For their use, therefore, the Company must pay rent.

Street lighting in Dunning, Perthshire, is conducted under somewhat difficult circumstances. Recently the Street Lighting Committee found that they had not funds wherewith to procure the necessary light; but they got up a concert, or entertainment of that description, and now they are out of their pecuniary difficulty.

Paradoxical though it may appear, the depression of the barometer and the fall of rain in Scotland during the past week has had a wonderful effect in raising the spirits of the good people of Greenock. Loch Thom has now some 15 or 20 feet of water, and it is expected that the factories will soon be running full time again. If there should be a sufficient fall to give a full supply of water to the sugar manufacturers, a great calamity upon the workpeople will be averted. In Dumbarton the rainfall has been such as to enable the authorities to double the hours of supply from five to ten; but in Crieff there are loud complaints that the springs are, in one part of the town at any rate, completely dried up.

There have been some lively proceedings in the village of Stanley, Perthshire, over the proposal to convert it into a water supply district. The village, which contains about 1500 inhabitants, is socially divided in two—the plebeians and the aristocrats. The former have been in somewhat destitute circumstances, on account of the failure of the wells supplying the village, while the latter have abundance of water for their

wants. The state of matters was represented to the Local Authorities of the parishes of Rodgerton and Auchtergaven by certain of the inhabitants, who wanted to convert the village into a water supply district; but the proposal being opposed, the Authorities refused the request. The case was then submitted to the Sheriff, who has granted the prayer of the petitioners, and at the same time his lordship has administered some seasonable advice to the opponents of the scheme.

The Dundee Water Commissioners resolved, at their meeting on Monday last, not to go on with the scheme for improving the water supply. The policy of postponing what really seems to be a crying necessity is creating much comment in the town, and the Commissioners are being accused of being shiftless and weak in their conduct.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

Contrary to expectation, no appointment has been made to the vacant, managership at the Coatbridge Gas-Works. It is now stated, however that a special meeting of the Directors of the Gas Company is to be held on Monday evening for the purpose mentioned.

During the last week of the Glasgow Gas Apparatus Exhibition meters were put on the gas supply mains for the purpose of determining the amount of an average day's consumption of gas, and the result arrived at was that about 1,200,000 cubic feet of gas had been consumed over the period that the exhibition was open, the total value of which, at 3s. 6d. per 1000 feet, would be about £210. It should be remembered that the exhibition hall was lighted with gas by day as well as by night, the daylight being almost entirely excluded. Notwithstanding the fact that there was such a large consumption of gas, and that there were upwards of 6000 gas connections, the atmosphere was remarkably pure after the ventilating arrangements were completed.

Amongst the notices already published of Bills for consideration in the ensuing session of Parliament, there is one of portentous length issued by the Municipal Authorities of the burgh of Irvine, and to which attention may be briefly directed. There are many proposals which the Bill aims at passing into law, the following being several of them:—To empower the Corporation to purchase and hold the undertaking of the Irvine Gaslight Company, &c.; to empower the Corporation from time to time to maintain, alter, improve, enlarge, extend, and renew, or discontinue the existing gas-works of the said Company, &c.; to empower the Corporation to supply gas for public and private purposes to and within the extended burgh, and the districts and places adjacent in the county of Ayr, &c.; and to empower the Corporation to provide or contract with any person or company for providing engines, works, appliances, and all necessary apparatus and materials for supplying electric light, and other light in addition to or in substitution for gas, and to use and employ the same for public and private purposes, &c. So far as I remember, this is the first instance of any Bill from a Scotch Municipality asking for parliamentary powers in connection with electric lighting.

At the meeting of the Ayr Police Commission, held last Monday, there was submitted a report from Mr. Robb, Works Manager for the Ayr Gas Company, stating that the gas supplied to the town had an average illuminating power equal to 26 standard candles. One of the members asked if there was no report as to the gas supplied in Newton, which is the portion of the burgh lying on the north side of the River Ayr, and which has a Gas Company of its own. The Treasurer replied that the Manager could easily supply a report like the one submitted.

I have referred a number of times during the last two or three years to the misunderstanding, now somewhat of a chronic character, existing between Councillor Tainsh and the Corporation Gas Committee of the town of Hamilton. Another "burst" took place at a special meeting of the Town Council which was held last Thursday, for the purpose of considering the alleged inaccuracies in the gas accounts. Provost Forrest, who presided, called attention to a correspondence in one of the Glasgow daily papers between Bailie Cassels, the Convener of the Gas Committee, and Mr. Tainsh, his predecessor in this office, and in the course of which the last-named gentleman had stated that, instead of a profit of £768, as shown in the printed balance-sheet, there was a loss of £299. He (Provost Forrest) had gone into the accounts, and produced a profit and loss account which he had made up, and which showed the correctness of the Committee's abstract. He also explained that the difference had arisen through Mr. Tainsh starting with £5058 for gas manufacture, &c., whereas it was £3942, the difference belonging to extensions. The Provost explained further that in the printed abstract a distinction was made between "materials, manufactured, maintenance, and repairs," and "extension of works." He admitted that Mr. Tainsh had some reason for taking the £5000 in starting, but after the explanations offered he hoped that he (Mr. Tainsh) would see that the accounts were correct. Bailie Cassels stated that the Committee refused to alter one item that would affect the result of their balance, and that they insisted that the Council would either acquit or condemn them. Mr. Tainsh refused to accept the statements given, and entered upon a long condemnation of the policy of the Gas Committee, stating that he had heard from some of its members the vilest insinuations against his character and motives—insinuations unworthy of public men, as they well knew they were gross untruths. After a long discussion a vote of confidence in the Gas Committee was agreed to, Mr. Tainsh protesting.

A meeting of the Town Council of Kilmarnock was held last Wednesday, when a report was submitted by Mr. Samuel Dalziel, Manager of the Gas-Works, which stated that the amount of gas sold during the four months ending Sept. 30, 1880, was 4,537,900 cubic feet, yielding £1039 18s. 8d., as against 4,832,450 cubic feet in the same period of last year, for which the sum of £1107 8s. 0¾d. was received. The illuminating power of the gas was—maximum, 28 candles; minimum, 25; average, 26 candles.

Business was done yesterday in Glasgow 9 per Cent. Corporation Gas Annuities at £226 per share.

An improving tendency has been shown by the Glasgow pig iron warrant market during the week. Good advices from America brought out a fair business at Friday's forenoon market, when up to 52s. 1½d. cash in a few days was paid. In the afternoon transactions took place at 52s. 3d. cash and 52s. 5d. one month.

A fair winter demand is experienced in the Glasgow coal market, yet all orders are getting prompt attention, as there is no scarcity of stock. Prices are firm, and have in some instances been advanced.

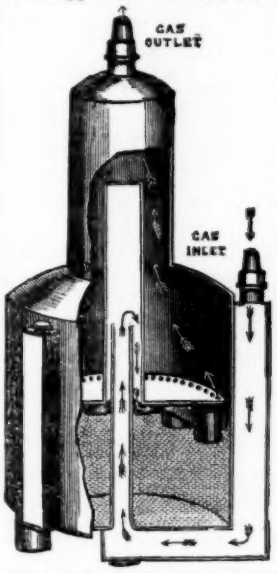
SHANGHAI WATER-WORKS COMPANY, LIMITED.—This Company was registered on the 2nd inst., with a capital of £100,000 in £20 shares, to supply the English, French, and American settlements at Shanghai, and the native city and neighbourhood, with water, and for such purposes to purchase land situate at Tangtsye Poo of the trustees of a water-works undertaking.

CLAY CROSS WATER SUPPLY.—It is locally reported that the Clay Cross Local Board having offered the Water Company of the town £12,000 for their works, or a sum just double the value of the original shares, and the offer having been refused, the Board have resolved to ask the assistance of the Local Government Board in bringing about a compulsory purchase.

THE "HELIOID" CARBURETTING APPARATUS.

The Universal Carburetting Company, of No. 31, Thornhill Road, N., have recently introduced to public notice a carburetting apparatus—styled the "Helioid"—the invention of Mr. Sanders Trotman, of Wanstead. The patent for the apparatus (No. 2874 of the present year) was taken out on the 12th of July, and the specification states that the invention is for "Improvements in Apparatus for Saturating Atmospheric Air or Gases used for Heating or Illuminating Purposes with Liquid Hydrocarbon."

The apparatus—which, by preference, is circular in shape—is shown in the accompanying illustration; and it is intended that it should be fixed so as to intercept the gas from the meter or other source of supply. As shown, the gas enters, by a tube, at the bottom, and passes into a vertical tube covered by another tube of larger dimensions working telescopically over it. Attached to the bottom of this latter tube, into which the gas enters freely, is a disc of the internal diameter (or nearly so) of the case. This disc is so supported by floats as to be always resting on the surface of the liquid hydrocarbon with which the vessel is filled, whatever its level may be. The gas thus traverses laterally beneath the disc, through the liquid, and escapes at the extreme edge of the disc, at which part a series of small holes are pierced, as shown, thus attenuating the bubbles or streams of gas, and perfecting the saturation. At the circumference of the disc there is soldered a flange of suitable depth, to prevent the passage of the gas otherwise than through the holes. To aid in the complete saturation of the gas there is also placed a second or inner flange, similarly perforated to the disc, or else spaced out from the disc so as to leave an annular gas-way equivalent in area to the inlet-pipe of the apparatus. At the top of the main chamber a smaller one is placed not only to allow the vertical pipe attached to the disc to rise and fall freely, according to the level of the hydrocarbon in the carburetting vessel, but also to act as a receiver of the saturated gas.



EXHIBITION OF GAS APPARATUS AT BLACKBURN.

An exhibition of gas cooking and heating apparatus, gas burners, engines, and other appliances connected with the consumption of gas, was opened in the Town Hall, Blackburn, on Wednesday last. It was promoted by the Gas Committee of the Corporation, and consists of exhibits from the various firms whose names are well known and whose goods are so familiar to all who attend these exhibitions. There are likewise several exhibits supplied by local tradesmen. Most of the goods are similar in character to those which have from time to time been noticed in the JOURNAL, and do not call for special notice now.

The opening ceremony was performed by the MAYOR (Alderman Harrison), who was accompanied by several Aldermen and Councillors, and attended by Mr. S. R. Ogden, the Corporation Gas Manager, under whose direction the arrangements of the exhibition have been carried out.

The MAYOR said he was glad that his first official appearance should be in connection with an exhibition of the present character, as he considered such exhibitions were interesting to all classes of the community. He believed that gas was only in its infancy as applied to domestic purposes, and was convinced that the gas-cooking appliances that had been already adopted to a considerable extent by the middle classes had proved of great benefit, and had conduced to economy and greater cleanliness in culinary matters. He believed the working classes would next take advantage of them, and he looked forward to the time when there would not be a cottage in Blackburn or any other town without its gas apparatus for cooking or warming. The introduction of the electric light had spurred forward the inventor, and already great improvements had been made in gas-burners; and burners which almost equalled electricity in power had been introduced into the houses and public streets. He believed the application of gas to the warming of houses and public institutions was only in its infancy, and he considered that every class of the community had reason to rejoice at the perfection of gas-cooking apparatus. There were two or three gas-engines in the exhibition, and he looked forward to their adaptation to small requirements in workshops and warehouses in Blackburn and other towns. He had slightly touched upon the advantages of gas in illumination, warming, cooking, and as a motive power; and he believed that in all those departments they had an exceedingly good exhibition. He trusted it would be to the benefit of the exhibitors, and believed it would be to the benefit of the gas department and inhabitants of the borough, and he had much pleasure in declaring the exhibition open.

Alderman BURY proposed a vote of thanks to the Mayor, and this was seconded by Alderman R. DUCKWORTH, and carried.

Arrangements have been made for the delivery of occasional lectures on cookery by Mrs. Thwaites, of the Liverpool School of Cookery, the subjects being superior household cookery and plain cookery.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

There has been a little more stirring in gas-making coals during the past week, owing to the recent foggy weather, which has caused consumers to come into the market for extra supplies of cannel, but where additional purchases have had to be made there has not been much difficulty in placing orders at about late rates. For cannel prices vary so much, according to quality, that quotations are scarcely possible, but for gas coals they average about 5s. 6d. per ton for common sorts, up to 7s. and 7s. 6d. per ton for the best qualities, at the pit mouth.

Other classes of round coal for house-fire purposes have been in good demand, and the pits generally throughout Lancashire are working full time. Colliery proprietors, as a rule, are holding out for advances of about 6d. per ton, and in some cases slightly more; best Wigan Arley being now firm at not less than 8s. 6d. per ton at the pit, Pemberton four-feet at 7s. to 7s. 6d., and common Wigan mines about 6s. per ton.

Common round coals for steam and forge purposes are not being pressed so much in the market, owing to a considerable quantity of these being taken into consumption for house-fire purposes, and prices, consequently, are harder; but where they have to be sold to manufacturers and forge proprietors, not more than about 3d. per ton upon late rates is obtain-

able, and for steam and forge coals the average prices at the pit mouth are about 5s. to 5s. 6d. per ton.

In engine classes of fuel there is more pushing to secure orders, and slack is easier in price. Good burgy at the pit is quoted at about 4s. to 4s. 6d., and good slack at 2s. 9d. to 3s. 3d. per ton.

Cokes are in moderately fair demand. Best gas cokes at the Manchester works are quoted at 5s., and good ordinary Lancashire-made cokes at the ovens at about 12s. per ton. Whilst I am referring to cokes, I may mention a suggestion I heard in the trade the other day, that the gases and other waste products from the coke ovens might very well be utilized to advantage. I do not know that the suggestion is particularly new, and I simply throw it out for what it is worth.

In the iron trade there is a generally more healthy feeling. Although consumers are so well covered for the present that there is little or no buying except for delivery into next year, there is more disposition to cover prospective forward requirements, and in some cases a slight premium upon present rates is being paid for extended deliveries. Lancashire makers are selling a fair quantity of pig iron up to the end of next March, at about 46s. 6d. to 47s. 6d per ton, less 2½ delivered equal to Manchester, and local bars can be bought for the same period at about £5 17s. 6d. to £6 per ton.

NOTES FROM MONMOUTHSHIRE AND SOUTH WALES.

(FROM OUR OWN CORRESPONDENT.)

The quantity of coal shipped at Cardiff during the past month was 116,593 tons more than was despatched in the corresponding month of last year, and there has also been an increase of 3913 tons at Newport. Swansea shows an increase of 664 tons, but at Llanelly there has been a falling-off to the amount of 2226 tons. In the coal trade the same activity prevails that characterized it during the past week. Nearly all the collieries in the Cardiff district are being worked with regularity. A little slackness has been experienced at the outports, but this is for want of tonnage. There have been 20,000 tons more coal shipped at Cardiff this week than in the previous one. In regard to freights there is a slight falling-off.

The shipments of iron at Cardiff during the past month were 4968 tons, at Newport 11,620 tons, and at Swansea 361 tons. The iron trade has given signs of improvement, and I may safely say the same in regard to steel. Blaenavon is about to adopt furnace improvements the same as at Tredegar, Rhymney, Treforest, and Llandore. The age of the old-fashioned dwarf furnace has passed away. The chief advantage gained by the change is the increased power, and the utilization of the coke. A large works at Llandaff have received some substantial orders. The proprietors will therefore be enabled to continue existing rates in consequence of their being fortunate enough to secure a better price, and ample employment can be given without having to resort to stocking.

In the tin-plate trade there is an improvement. One of the principal makers of tin-plates is not only pressed for early deliveries, but within the last few days he has concluded contracts of a satisfactory character at advanced rates.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

Coal is in fairly brisk request throughout the South Staffordshire district, and but little doubt exists that an improvement over the present state of things will follow during the winter quarter. Complaints of underselling, too, are less frequent than they have been for a considerable time. Thick coal keeps up in price, but the demand is greatest for best qualities of household fuel. Iron-making kinds are in better call, but more in particular forge qualities. The call for slack is good, but prices are still low, as indeed are those of most of the cheaper qualities. In the Cannock Chase district good fuel is being sold at the pit's mouth for 8s. 6d. and 9s. A further increase in rates generally is expected. Coke is plentiful, and prices remain unaltered. There is also a tolerably good market for iron-stone and other minerals.

The iron trade continues to show a hopeful aspect. During the past week the markets have been well attended, and the sales effected have for the most part been of an improved character. Perhaps in no week for several months past has the business been of a more substantial kind than in the last. The finished iron trade in particular is the more active, and orders for several qualities are numerous. Manufacturers of unbranded bars are asking an advance of 2s. 6d. per ton over last week's quotation. Quotations, however, may be said to be much firmer all round; but marked bar makers have a good stock of orders on hand, and prices remain at £7 10s. Several lots of second-class bars have, however, been placed at £7. The call for sheets and hoops is well sustained at £7 10s. and £7 15s. There is more doing in galvanized sheets for export trade. Nail rods are also well looked after, both for home and foreign consumption, and the rates have risen as much as 2s. 6d. and 5s. per ton in several instances. Girders, angles, and tees are firm, and more business is said to be doing. Some improvement is also discernible in the pig trade generally, and rates a trifle higher are being asked by some of the leading makers. There is, however, an abundant stock in the market, a great quantity being offered from surrounding districts. All-mine pigs are in best request, as cinder pig is the most plentiful. The improved demand for best foreign pigs enables local makers to hold out for firmer rates than otherwise they would be able to do. In several branches of the heavy iron foundry full time is being made. The departments of tube-making, also those of edge tool, hydraulic machinery, axle-tree, and the like, are reporting a steady state of trade.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The iron trade in the West Yorkshire district is active, there being a large output of the best brands of Yorkshire iron. There is, however, not so much activity in the southern part of the district, particularly with regard to foundry material and merchant iron. There is still a very good business doing in pig iron at the furnaces in South Yorkshire, and prices are somewhat better than they have been.

The ordinary coal trade at the pits in the Wakefield, Leeds, and Normanton districts shows still further improvement, and miners at most places are making nearly full time. Prices have as yet but slightly increased, there being a great amount of competition to encounter. Some of the collieries in the Normanton district are sending an improved tonnage to London. For other kinds of coal business is not over active, but a few of the West Riding pits, producing a good class of steam coal, are keeping up a good trade with Hull, both by land and water.

The pits in the South Yorkshire coal-field also continue to work better than they did, and at most places the general coal trade is very good. The quantity forwarded to London is, however, not nearly so large as it ought to be, and this, the coalowners contend, has been brought about by the high tonnage rates imposed by the Railway Companies, which are still about 8s. 3d. from the district pits to London, including City dues. Considering the splendid quality of coal produced, it is surprising that last month only about 1300 tons of Silkstones were sent by rail from eight of the leading pits working that seam, whilst the thick coal collieries also did but a moderate business.

In steam coal there is scarcely so much doing, although Denaby Main, Manvers Main, and other district pits sent a large tonnage by both rail and water to Hull last month. The fact that both the house and steam coal has to be raised from the same bed renders it exceedingly difficult for coalowners; for when the house trade is active there is but little doing in hard coal, and *vice versâ*. The gas and locomotive contracts continue to absorb a good deal of this class of coal, raised at the district pits, some of which are working full time. In consequence, nuts are not in over good request, and were it not that the coke trade continues active, slack and smudge would be a drug in the market. The coke trade holds well up, notwithstanding that the output was never so large for years as at the present time.

Sale of Chester Gas Company's Stock.—The Chester United Gas Company recently sold by tender, in lots of £100 each, £10,000 of their ordinary stock, bearing a maximum dividend of 7 per cent.; and the average price realized was £22 17s. 11d. per cent. premium.

Woking and Horsell Gaslight and Coke Company, Limited.—This Company was registered on the 4th inst. to supply gas to the parishes and districts of Woking and Horsell, Surrey. The capital is £15,000, in £5 shares.

Sale of Shares in the Lincoln Gas Company.—On Friday, the 5th inst., there was offered for sale by auction in Lincoln £114 worth of the improvement stock of the Lincoln Gas Company, and it realized £143. On the same occasion an old £25 share in the Company was sold for £63, and two new £50 shares for £87 each.

Reduction of Price by the Airedale Gas Company.—The Directors of the Airedale Gas Company intend reducing the price of gas from 3s. 9d. to 3s. 4d. per 1000 feet on all accounts paid within two calendar months from the expiration of each quarter. This reduction will take effect from Oct. 1.

Kirkham Gas Company, Limited.—This Company, registered on the 2nd inst., is to take over a concern originally constituted by deed of co-partnership on the 26th of July, 1838, and by supplementary deeds dated May 4, 1840, Nov. 6, 1848, and Nov. 6, 1866. The capital is to be £15,000, divided as follows:—660 A shares of £5 each, 330 B shares of £2 10s. each, 330 C shares of £10 each, 505 D shares of £15. The A, B, and C shares are subscribed for; A and B being fully paid up, while £2 per share has been paid on C. The D shares are not yet subscribed for.

Income-Tax Deductions for the Current Half Year.—Mr. John Goodier, the Registrar of Consolidated Stock of the Manchester Corporation, has recently been in correspondence with the Inland Revenue Board as to the right amount of income-tax to be deducted, on the 24th prox., from the half year's interest upon the Manchester Corporation Consolidated Stock—and, of course, the same principle applies to all interest on shares and stock. Replying to Mr. Goodier's inquiry, Mr. F. P. Garnett, on behalf of the Board, writes as follows:—"I am directed to acquaint you that as it appears that a deduction was made at the rate of 5d. only from the half year's dividend paid on the 24th of June last, the Board consider the deduction now to be made should be at the rate of 7d. It will, of course, follow that on the 24th of June, 1881, the income-tax to be deducted from the dividends will be at the rate which may be imposed for the financial year 1881-82."

Mansfield Improvement Commissioners Gas Supply.—At the meeting of the Mansfield Improvement Commissioners on Friday, the 5th inst.—Mr. G. Pilkard in the chair—the report of the Gas Committee for the five quarters ending March 25, 1880, was presented. It stated that the quantity of gas made for the year ending March 25, 1880, was 42,437,000 feet, and for the year ending March 25, 1879, 43,956,000 feet, being a decrease of 1,600,000 feet. The illuminating power had been maintained throughout at 18 candles and upwards. The number of public lamps had been increased from 198 to 227, and the cost for gas for the five quarters had been £656 3s. 8d., or an average of £2 8s. 9d. per lamp per year. The cost of lighting had been £187 10s. for the five quarters, or an average of 13s. per lamp per year. The price of gas was reduced to the public on Sept. 29, 1879, at an estimated cost to revenue of £350 per year. The accounts showed that the expenditure on capital account had been £393 1s. 5d.; and the expenditure on revenue account, £7107 18s. 2d. The receipts from gas-rentals had been £9705 1s. 11d.; residuals, £1013 17s. 5d.; sundries, £114 14s. 8d.—total, £10,833 14s., showing a gross profit of £3725 15s. 10d. From this had to be deducted £1779 14s. 3d. interest to debenture holders, and £350 payment to sinking-fund, leaving a net profit of £1596 1s. 7d. The Committee recommended that the sum of £1596 1s. 7d. be carried to the reserve-fund, which would then amount to £2325 18s. 3d., and would be used as working capital. The profit made during the past five quarters was much larger than could be calculated upon in the ensuing year; but the Committee considered that there would be a probable surplus of £650. The Committee also recommended that a reduction be made in the charge for gas supplied to and the lighting of the public lamps, and that for the future a fixed charge of £2 per lamp per annum be made, such sum to include the whole cost in relation thereto, except the cost of erecting any new lamps; and that the price of gas be reduced to consumers, from the 29th of September last, as follows:—Under 20,000 feet per quarter, 3s. 9d. per 1000 feet; 20,000 and under 50,000 feet, 3s. 6d. per 1000 feet; 50,000 and under 500,000 feet, 3s. 3d. per 1000 feet; 500,000 feet and upwards, 3s. 2d. per 1000 feet; and that the price of gas to Mansfield Woodhouse be fixed at 3s. 6d. per 1000 feet. The report was unanimously adopted.

Register of Patents.

APPLICATIONS FOR LETTERS PATENT.

4545.—Stainton, W., King's Cross, London, "Improvements in pipe couplings, nuts for bolts, and the like." Nov. 6, 1880.

4547.—Macfarlane, T. D., Glasgow, "A new or improved gas-engine." Nov. 6, 1880.

4579.—Goldsmith, J. S., New York, U.S.A., "Improvements in combined shades and reflectors for gas and other lamps or burners." Nov. 8, 1880.

4626.—Lake, W. R., Southampton Buildings, London, "Improvements in apparatus for lighting and extinguishing gas by means of electricity." A communication. Nov. 10, 1880.

4633.—Bickerton, H. N., Ashton-under-Lyne, Lancs, "Improvements in gas motor engines." Nov. 11, 1880.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1901.—Dann, J. T., Brixton, Surrey, "Improvements in the construction of apparatus for lighting and extinguishing gas-burners by automatic means." A communication. May 10, 1880.

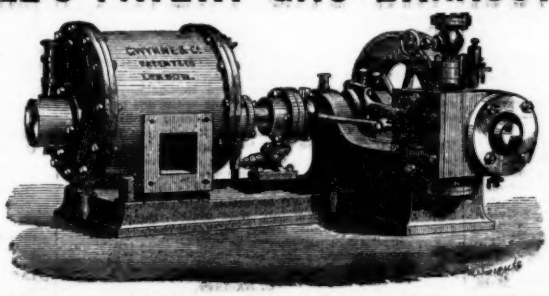
1969.—Haigh, W. B., and Nuttall, J., Oldham, Lancs, "Improvements in gas-engines." May 13, 1880.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO., for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.

GWYNNE & CO.

Have made the largest and most perfect GAS-EXHAUSTING MACHINERY in the world, and have completed Exhausters to the extent of 14,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



The Judges report on the COMBINED EXHAUSTER and STEAM-ENGINE exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO.'S COMBINED ENGINE AND EXHAUSTER.

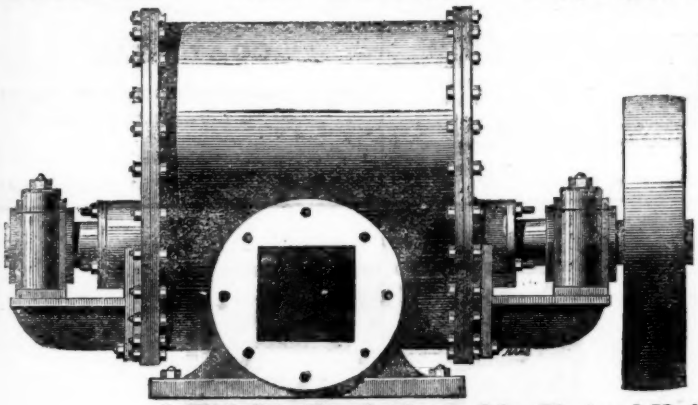
GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, **GWYNNE & CO.**, Hydraulic and Gas Engineers,
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



WITH OR WITHOUT
WROUGHT-IRON SPINDLES AND
ENGINES COMBINED.

GEORGE WALLER & CO.,
MAKERS OF
ENGINES, EXHAUSTERS,
INDEX AND DISC GAS-VALVES,
HYDRAULIC MAIN VALVES,
BYE-PASS VALVES,
TAR, LIQUOR, AND OTHER PUMPS,
SCRUBBERS AND PURIFIERS,
CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

PHŒNIX ENGINEERING WORKS:
HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of a Pamphlet, prepared for Gas Companies to distribute to Gas Consumers—"Cooking & Heating by Gas;" on Burners, &c.
Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

WANTED, to place a Youth at a Gas-Works with a Gas Engineer, as PUPIL.
Terms and conditions, which must be moderate, may be sent to No. 701, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, a Young Man, aged 27, an Engagement in a Gas Company's Office, Assistant Engineer, or Clerk of Works, &c., has had every experience in a Gas-Works. First-class testimonials and references.
Address No. 695, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED.—The Advertiser, a Young Man, aged 39, married, is open for an Engagement as MANAGER and SECRETARY of a medium-sized Gas-Works, or SUB-MANAGER of a large Works. Has a thorough Knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 16 years. Highest testimonials and references.
Address No. 678, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Advertiser, a Young Man, aged 23, is open for an Engagement as MANAGER and SECRETARY of a medium-sized Gas-Works; or SUB-MANAGER of a large Works. Has a Knowledge of the Manufacture and Distribution of Gas in all its branches; having had the management of Gas-Works for some time. Highest testimonials and references.
Address F. S., Gas-Works, WIGAN.

WANTED, by a Young Man (married), a Situation in a Gas-Works. Is the son of a Manager, and is a good Main and Service Layer. Can do any Fittings in the Retort-House; also can Fix and Read Indexes of Meters, and has had experience both at Lathe and Vice. Very steady.
Apply to the MANAGER, Gas-Works, Crayford, KENT.

TO GAS ENGINEERS AND CONTRACTORS.

A Practical Mechanical Engineer, good Draughtsman, who understands the Manufacture of Gas, desires an Engagement as AGENT or ASSISTANT. Has a knowledge of French and Italian.
Apply to J. B. C., 62, Westmoreland Street, PIMLICO.

TO MAIN-LAYERS.

WANTED, Two or Three First-class MAIN and SERVICE LAYERS.
Apply, by letter only, with reference, stating wages required, to J. and H. ROBUS, Contractors, Bell Green, LOWER SYDENHAM, S.E.

MAIN AND SERVICE LAYER.

WANTED immediately, a Main and SERVICE LAYER for a Gas-Works in South Wales. A permanent engagement to a steady, experienced man.
Address, with all particulars, No. 699, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ACCOUNTANT WANTED.

WANTED, by a Gas Company in the Provinces, an Experienced ACCOUNTANT, who understands Book-keeping by Double Entry, on the most approved principles; also the Preparation of the Annual Balance-Sheets, and the routine of an Office. Salary £150 per annum.
Applications to be made, in own handwriting (and the highest references required), to No. 698, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, several good Lead Service-PIPE LAYERS; must be accustomed to the use of the Blowpipe, Copper Bit, and Plumbing Iron. None need apply whose qualifications will not bear the strictest investigation.
Apply to the GAS MANAGER, WIGAN.

FOR SALE.

THE Leigh Local Board invite Offers for Four Second-hand PURIFIERS, 10 ft. by 10 ft. by 4 ft. 6 in., with Hydraulic Centre-Valve and 10-in. Connections and Two Lifting Cranes.
JOS. TIMMINS, Engineer, &c.
Leigh, Lancs.

THE Gloucester Gas Company have the undermentioned APPARATUS for Sale:—
About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.
Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.
Exhauster (Jones) to pass about 15,000 feet per hour.
Exhauster (Beales) to pass about 25,000 feet per hour.
Two Vertical Steam-Engines, each about 6-horse power, with Pulleys, and Shafting used for driving the above.
Boiler 14 ft. 6 in. by 3 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.
4-horse power Horizontal Steam-Engine.
Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.
Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.
Gasholder, Double Lift, capacity 100,000 feet.
Gasholder, Double Lift, capacity 240,000 feet.
One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.
Two 12-in. four-way faced Valves, by Cockey.
For further information, &c., apply to the undersigned.
R. MORLAND, Engineer.

FOR SALE — One 7-in. Gas Governor, with 7-in. Valves and Bye-pass complete; in good condition. Offers wanted.
Apply to W. WEDGWOOD, Gas-Works, ILKLEY.

FOR SALE.—Two Purifiers, 9 ft. by 4 ft., with Partition in centre, wrought-iron Covers, Four-way Valves and Connections complete. One STATION-METER, 5 ft. diameter, to pass 3600 ft. per hour, with 6-in Connections complete; also 6-in. Four-way VALVES.
To be seen on application to the Manager, Crayford Gas-Works, Kent.
Tenders to be sent, sealed, to the Offices of the West Kent Gas Company, 237, Southwark Bridge Road, S.E., on or before Nov. 27.
R. P. KEYS, Secretary.

GAS COALS WANTED.

THE Directors of the Sheppy Gas Company invite TENDERS for the Supply of about 4500 Tons of GAS COALS, within Twelve months commencing Jan. 1, 1881, to be sent in in such quantities and at such dates as the Directors may require them, and to be delivered alongside the Company's wharf and steam-lift at West Minster, between Queenborough and Sheerness. The Coals to be delivered free of all charges, excepting Queenborough and Rochester Harbour dues.
The kinds tendered for to be Pelaw Main, Pelton Main, Pontops, or Holmsides, separate prices per ton to be named for each kind, if more kinds than one are tendered for. All Coals supplied to be free from sulphur or bats. Payment will be made three months after the date of delivery, or if immediately on delivery, subject to discount, which must be stated, and the quantity paid for will be that certified by a sworn Meter (who will be paid by the Company) as having passed over the Company's weighing-table.
Tenders must be delivered at the Company's Office as below, marked on the outside "Tender for Coals," before 10 a.m. on Wednesday, Dec. 1, 1880.
The Directors do not bind themselves to accept the lowest or any other tender.
By order of the Directors,
A. W. MARKS, Secretary.
Company's Office, 2, Trinity Road,
Sheerness-on-Sea.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Sheppy Gas Company invite TENDERS for the year 1881, for the Purchase of their whole make—say about 60,000 Gallons—of AMMONIACAL LIQUOR, and their surplus make beyond retail sales and Government contracts—say about 35,000 Gallons of GAS TAR. The same to be delivered, free of cost, by the Company into the Contractor's tank-barges, alongside the works at West Minster, between Queenborough and Sheerness. The tenders to state the price per gallon to be paid for tar, and the price per 1000 gallons for every half degree Twaddel of strength to be paid for Liquor, from 4° to 9°. Tenders may be sent in for Tar or for Liquor only, but preference will be given to tenders for both Tar and Liquor from the same firm. Option may be given to extend tenders so as to include the years 1881 and 1882. Payment to be made monthly, and within 7 days of presentation of account.
Tenders must be delivered at the Company's Office, as below, marked on the outside "Tender for Tar, &c.," before 10 a.m. on Wednesday, Dec. 1, 1880.
The Directors do not bind themselves to accept the highest or any other tender.
By order of the Directors,
A. W. MARKS, Secretary.
Company's Office, 2, Trinity Road,
Sheerness-on-Sea.

BROMLEY GAS CONSUMERS COMPANY
(Incorporated by Act of Parliament in 1865.)

ADDITIONAL CAPITAL.

NOTICE is hereby given that under the powers conferred by the Bromley Gas Act, 1879, the Directors are prepared to receive TENDERS for the Purchase of 400 ORDINARY SHARES of the nominal value of £10 each, in lots, not being less than five of such Shares, or a multiple thereof.
The Shares tendered for will be entitled to a dividend not exceeding 7 per cent., except as in the said Act is provided.
Conditions of sale and forms of tender may be obtained upon application to the Secretary of the Company, at the Works, Bromley, Kent; or of Messrs. Lotter and Willett, Market Square, Bromley, Kent; Messrs. Robarts, Lubbock and Co., 15, Lombard Street, London; or Messrs. Mortimer and Son, 4¼, Warnford Court, London.
Tenders must be sent in not later than Wednesday, Dec. 1, 1880, at Three o'clock in the afternoon, addressed to the undersigned, at the Company's Works, Bromley, Kent.
GEORGE H. OSBORN, Secretary.
Bromley, Kent, Nov. 8, 1880.

TO TAR AND AMMONIA DISTILLERS, &c.

THE Directors of the Redhill Gas Company are prepared to receive TENDERS for the Surplus TAR and AMMONIACAL LIQUOR produced at their Works for One, Two, or Three years, from Jan. 1, 1881, or such other terms as may be agreed upon.
Particulars respecting quantity, &c., may be had on application to the Manager, at the Works, Redhill, Surrey
Tenders to be delivered or sent, so as to be at the Gas-Works not later than Tuesday, the 30th inst., and endorsed "Tender for Surplus Tar and Ammoniacal Liquor."
By order of the Board,
C. READ, Manager and Secretary.
Gas Office, Brighton Road, Redhill,
Surrey, Nov. 5, 1880.

MR. W. H. ALLEN begs to advise the public that he has resigned the appointment he has held for the past twelve years, as Manager to the firm of Messrs. Gwynne and Co., the Hydraulic and Mechanical Engineers, of Essex Street Works, Victoria Embankment, London; and has taken the Engineering Works lately occupied by Messrs. Merryweather and Sons, in York Street, Lambeth (who have removed to larger premises at Greenwich), where he has commenced business as a manufacturer of Special Machinery of the best London make.
He has taken into partnership Mr. Richard Wright, who occupied a position under him for many years at the above works.
The style of the firm will be W. H. Allen and Co.
York Street Works, Lambeth, S.E., Nov. 1, 1880.

MALTA.

LIGHTING BY GAS VALLETTA, FLORIANA, MARSA, SENGLEA, COSPICUA, & VITTORISSA.

SEALED Tenders will be received at this Office until noon of Monday, June 3, 1881, for Lighting by Gas the Streets of Valletta, Floriana, Marsa, Senglea, Cospicua, and Vittorissa, for a period of Ten years, to date from May 15, 1882.
Tenders to be on the established printed form supplied by this Office.
The conditions of the contract and further particulars will be made known on application to this Office.
Each tender is to be accompanied with a deposit of £200, which sum is to be temporarily lodged with the Receiver-General, to be dealt with as stated hereunder; and no notice will be taken of any tender unless the due fulfilment of this condition be found endorsed thereon by that Officer.
The deposit thus made shall be forfeited in favour of Government should the party tendering, or the surety, fail to appear for the stipulation of the requisite contract in the event of the tender being accepted, within three days from the day of the notice given to him to that effect.
The deposits of the unsuccessful tenderers shall be returned to them immediately after notice will have been given to the party whose tender will have been accepted.
Any notarial fees will have to be paid by the Contractor.
The undersigned retains the power of accepting or rejecting all or any of the tenders received.
C. RAPINET,
Acting Auditor-General and
Director of Contracts.
Office of the Auditor-General and Director of Contracts, Valletta, Oct. 7, 1880.

TAR PLANT.

SPECIFICATIONS and Tenders are invited for the Supplying and Erecting of APPARATUS complete for a small TAR-WORKS.
Particulars on application.
The Company do not bind themselves to accept the lowest or any tender.
JOHN J. JERVIS, Manager.
Swindon New Gas Company, Limited.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Worksop Gas Company invite TENDERS for the Purchase of their Surplus TAR, from the present time to such length of time as the Manager and the Purchaser may arrange upon.
Tenders to be sent to my Office before the 25th inst.
WM. BATES, Engineer and Manager.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS REPORTS for 1869, 1870, and 1876.

THE Institution of Civil Engineers require the above-named reports in order to complete their set.
Any one, having copies to spare of any or all of the three, will oblige by communicating with the Secretary of the Institution,
JAMES FORREST.
25, Great George Street, Westminster, S.W.

AMMONIACAL LIQUOR.

THE Warwick Gaslight and Coke Company invite TENDERS for the Purchase of the whole of their AMMONIACAL LIQUOR, for a term of One or Three years, commencing Jan. 1, 1881.
WALTER T. TEW, Manager.
Warwick, Nov. 10, 1880.

THE Hindley Local Board are prepared to receive OFFERS for One GASHOLDER, 50 ft. by 20 ft., with Six Pillars, Counterbalance-weights and Chains to each, wrought-iron Lattice Girders complete, with 8-in. Inlet and Outlet Connections; One Walker's Patent 8-in. Valve on outlet; One cast-iron Syphon Pump on inlet; 226 ft. of 8-in. Gas-Main Pipes, socket jointed. The whole of the best materials, by D. Howard and Son, West Bromwich; in use only six years.
Can be seen at Platt Bridge, Hindley.
Communications to be made to the undersigned.
By order,
STEPHEN HOLT, Clerk to the Board.
Offices, Cross Street, Hindley, Nov. 11, 1880.

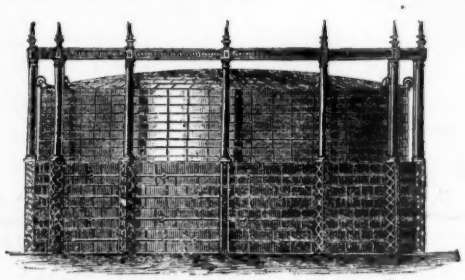
TAR AND AMMONIACAL WATER.

THE Hindley Local Board are prepared to receive TENDERS for the TAR and AMMONIACAL WATER to be produced at their Works at Cross Street, Hindley, for a term of One or Three years, commencing Jan. 1, 1881.
Full particulars as to conditions, quantities, &c., and forms of tender, may be had from the undersigned.
By order,
STEPHEN HOLT, Clerk to the Board.
Offices, Cross Street, Hindley, Nov. 11, 1880.

Price 28s. each, handsomely bound in Morocco, cloth sides, gilt edged and lettered.

THE FIRST AND SECOND VOLUMES
OF
KING'S TREATISE
On the Science and Practice of the Manufacture and Distribution of
COAL GAS.
Edited by THOS. NEWBIGGING, C.E., M.Inst.C.E.
and W. T. FEWTRELL, F.C.S.

Orders received by
WALTER KING, 11, Bolt Court, Fleet Street, London, E.C.



HENRY BALFOUR & CO.,
ENGINEERS, IRONFOUNDERS, AND GAS APPARATUS MAKERS,
39, FINSBURY CIRCUS, LONDON, E.C.
Works: DURIE FOUNDRY, LEVEN, FIFE, N.B.
MANUFACTURERS OF
GASHOLDERS, SINGLE OR TELESCOPE, WITH OR WITHOUT COUNTERBALANCE GEAR; TANKS, CAST & WROUGHT IRON.
BOILERS, CONDENSERS, CRANES, EXHAUSTERS AND ENGINES,
GIRDERS (Cast and Wrought Iron), IRON PIPES, PUMPS, PURIFIERS, RETORTS & FITTINGS, ROOFS, SCRUBBERS, SHAFTING, VALVES, WASHERS.
ANDERSON'S PATENTED INVENTIONS, VIZ.—
FOUR-WAY BYE-PASS VALVES, ENGINES AND EXHAUSTERS, REVOLVING BRUSH SCRUBBERS, GAS-WASHERS, FUEL-MAKING MACHINES, GOVERNORS, &c.
H. B. & Co. undertake Contracts for the Supply and Erection of Gas-Works, either for Towns or Mansions, or the Remodelling of existing Works.
SHIPPING ORDERS receive special attention.
H. B. & Co. having had large experience in this Department, undertake to ship, f.o.b., properly packed and marked for export.
ESTIMATES AND DESIGNS ON APPLICATION.

Now ready, Second Edition, price 7s., by post 7s. 3d., the

GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, M.I.C.E.

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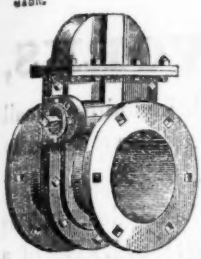
B. DONKIN & Co.'s
IMPROVED GAS-VALVES

WITH WROUGHT-IRON PINIONS.

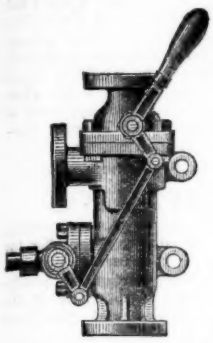


These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.

In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

Also Sole Makers of
J. BEALE'S NEW PATENT GAS EXHAUSTERS,
and Makers of
STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS,
VALVES FOR AMMONIACAL LIQUOR,
IMPROVED BRIDGE VALVES FOR REGULATING THE SEAL IN HYDRAULIC MAINS,
BYE PASS VALVES, SCREW WATER-VALVES, &c.

B. DONKIN & Co., BERMONDSEY, LONDON, S.E.



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ENTIRELY SELF-REGULATING.

LIFTS 26 FEET.

FEEDS WITH HOT OR COLD WATER.

WORKS WITH HIGH OR LOW STEAM PRESSURE.

Price Lists on application to

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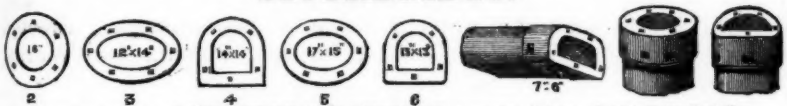

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Manufacturers of FIRE-CLAY GAS RETORTS, Lumps, Tiles, Best Fire-Bricks, and every requisite for Gas-Works.

Large Stock of all Sizes of Retorts on Hand.

ANTI-CORRODO TUBES
(BARFF'S RUSTLESS PROCESS)

See Professor FOSTER'S *Article on "The Corrosion of Iron" in* JOURNAL *of March* 30, 1880.

THE RUSTLESS AND GENERAL IRON COMPANY
(JAMES E. AND SAMUEL SPENCER),
Makers of ANTI-CORRODO (BARFFS) TUBES AND FITTINGS
For Gas, Steam, and Water; also Black Galvanized and Enamelled.

WORKS: West Bromwich. *Quotations and Pamphlet on application to* 97, CANNON STREET, LONDON, E.C. LIVERPOOL OFFICE: 34, Moorfields.

THE
THAMES BANK IRON COMPANY,
UPPER GROUND STREET, LONDON, S.E.,
SUPPLY FROM STOCK
CAST-IRON RETORTS AND ALL KINDS OF GAS-WORKS APPARATUS,
SOCKET-PIPES FOR GAS OR WATER PURPOSES,
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RAIN-WATER PIPES AND GUTTERS,
HOT-WATER BOILERS, PIPES, AND CONNECTIONS,
LAMP-COLUMNS, LAMPS, LAMP-FRAMES, WROUGHT TUBES, &c.,
HOT WATER AND HOT AIR APPARATUS,
Erected complete on the most Improved Principles.

MR. CORBET WOODALL, C.E.,

Has Removed his Office to

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NOTICE OF REMOVAL.

THE OWNERS OF
THE
BIRTLEY IRON-WORKS
AND
PELAW MAIN COLLIERIES

Have REMOVED their London OFFICES from No. 101, Cannon Street, to No. 46, Cannon Street.

Their Warehouse for Gas and Water Pipes and other Castings is at Scott's Wharf, Bankside, SOUTHWARK.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 42, Great George Street, WESTMINSTER.

GARSIDE'S IMPROVED MAIN
DRILLING CLIP.

No. 1 takes from 2-in. to 6-in. Mains.
No. 2 takes from 6-in. to 12-in. Mains.

GARSIDE'S REGISTERED TUBE-VICE takes ¾ brass to a 2-in. Socket.

May be had direct from the maker, SAMUEL GARSIDE, Gatefield Iron-Works, ASHTON-UNDER-LYNE.

WOOD
TROUGHING
For Preserving Service-Pipes.
Price from Three-Farthings per Foot,
In any Lengths.
THOS. PROUD,
Brookfield Works, Icknield St., Birmingham.

W. C. HOLMES & Co.,
ENGINEERS AND CONTRACTORS
FOR
GAS AND WATER-WORKS,
WHITESTONE IRON-WORKS,
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REFERENCES TO UPWARDS OF 400 WORKS.

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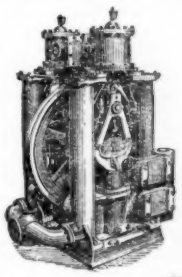

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PATENT LEVER
PUNCHING MACHINES
AND HIS
STEAM-PUMPS
FOR
GAS-WORKS,
Feeding Boilers, Steam Fire-Engines, Colliery Deep Lifts, Irrigation, Contractors, and Chemical purposes.

WORKS:
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WARNER'S RETORT-HOUSE MACHINERY.

[*As Illustrated and Described in the* JOURNAL *for May* 4.]

Communications to be addressed to

W. J. WARNER, GAS-WORKS, SOUTH SHIELDS.

SAMUEL CUTLER & SONS,

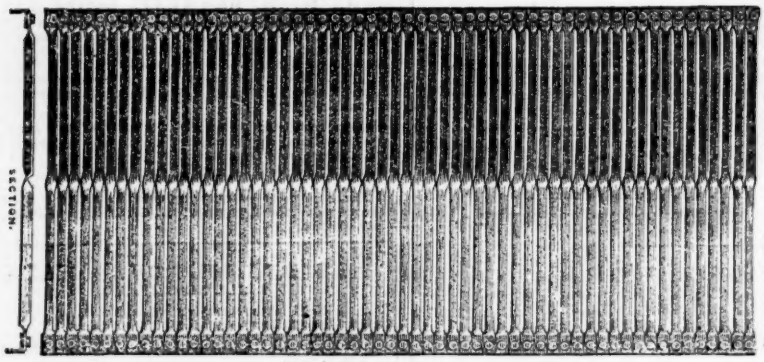
MILLWALL, LONDON, E.,

CONTRACTORS FOR THE

ERECTION OF GAS AND WATER WORKS,

Undertake their ENTIRE ERECTION or EXTENSION in any part of the World, including Small Works for VILLAGES and MANSIONS, as well as of very LARGE EXTENT. Have recently constructed for the PHŒNIX GAS COMPANY the LARGEST GASHOLDER yet erected.

S. C. and SONS supply *every* requisite for Gas-Works, and keep in stock Small Articles, such as BARROWS, SCOOPS, RETORT-LIDS, BOLTS, &c.; and they manufacture WOOD SIEVES of a very superior description.



CUTLER'S PATENT WATER-VALVES

Are the very best possible as PURIFIER VALVES; leakage impossible, most easy to work, never get out of order or the worse for wear, and can, if desired, be very simply arranged to work the whole or a part of a set of Purifiers in any conceivable order whatever. Have already been erected and approved at the London Gas-Works, Nine Elms; Phœnix Gas-Works, Greenwich; Maidstone, Ipswich, &c.

Full Particulars on Application.

CUTLER'S PATENT SIEVES

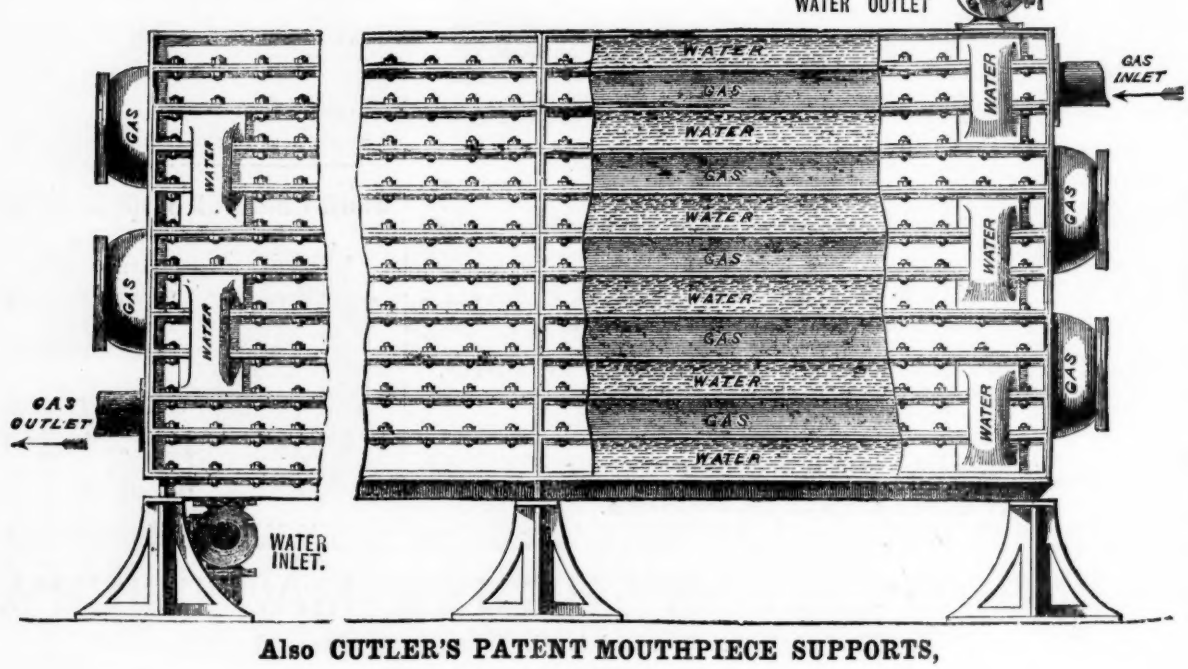
Are the most durable. The sieve bars presenting an inclined plane to the flow of the Gas, offer the least possible resistance, greatly reducing pressure, and permitting contact with every part of the purifying material. Have been supplied to many of the London and Provincial Gas-Works, and give great satisfaction.

Copies of Testimonials on Application.

MORRIS AND CUTLER'S PATENT CONDENSERS

Adopt water as a cooling medium, the respective streams flowing in opposite directions; quantity of water required but small, and being only raised in temperature, is useful for any purpose of the works. The power of Condensers can be regulated at will by the amount of water permitted to pass through. Erected and giving great satisfaction at Brentford, Tunbridge Wells, Maidstone, Buxton, Phœnix Gas-Works, Greenwich; where its advantages may be seen.

Mr. WATES, of Greenwich, has kindly offered to reply to any inquiries addressed to him as to its efficiency.



Also CUTLER'S PATENT MOUTHPIECE SUPPORTS,

AND

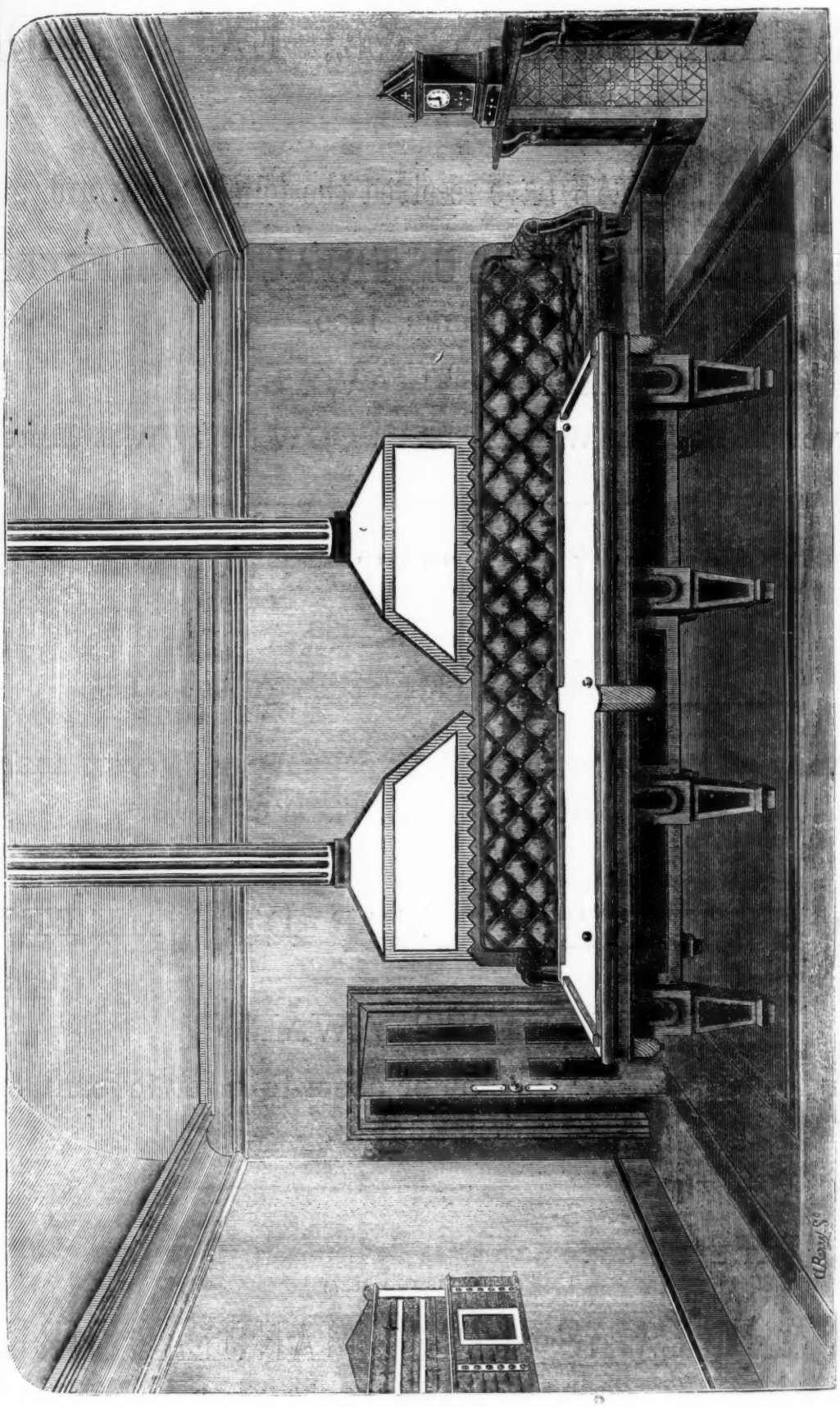
CUTLER'S PATENT REMOVABLE DIPS.

[*See* JOURNAL for Nov. 25, 1879.]

THE LATEST NOVELTY

FOR THE EFFECTIVE LIGHTING of BILLIARD TABLES.

BILLIARD TABLE LIGHTING BY WILLIAM SUGG'S PATENT SELF-VENTILATING SYSTEM AND BURNERS OF HIGH ILLUMINATING POWER,



Securing a Total Absence of Heat and Shadow, with a Steady and Brilliantly White Light, and Small Consumption of Gas.

N.B.—All products of combustion are carried away into the open air, and cannot, therefore, mix with and vitiate the atmosphere of the room.

One of the above has been fitted up in the Filliard-Room of the Raleigh Club, Regent Street, and the Secretary states that the Table is the best lighted he has ever seen.

APPLY TO

WILLIAM SUGG,

VINCENT WORKS, WESTMINSTER, & GRAND HOTEL BUILDINGS, CHARING CROSS.

MANCHESTER AND GLASGOW

GAS APPARATUS, &c., EXHIBITIONS.

W. & B. COWAN have received the following awards:

MANCHESTER INDUSTRIAL EXHIBITION,

OCTOBER, 1880.

HIGHEST AWARD,

Silver Medal for WARNER & COWAN'S Wet Meters.

PHILOSOPHICAL SOCIETY'S EXHIBITION,

GLASGOW, 1880.

SPECIAL HIGHEST AWARD,

FOR

Accuracy of Registration and Excellence of Workmanship of WARNER & COWAN'S Wet Meters.

HIGHEST AWARD FOR DRY METERS.

HIGHEST AWARD

For 10-feet Testing Gasholder according to Government Standard.

W. & B. COWAN,

(ESTABLISHED 1827,)

WET & DRY GAS-METER MANUFACTURERS,

CHURCH STREET,
MILLBANK STREET,
LONDON, S.W.

DUTTON STREET,
NEW BRIDGE STREET,
MANCHESTER.

BUCCLEUCH ST. WORKS,
EDINBURGH.

The understated declaration with which we introduced our apparatus when the Argand system was in the full tide of its fame, has been fully borne out by general experience, namely—

"THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING; and, 'in actual use,' yields as much light with Common Gas, and more with Cannel Gas, than any Argand System."

CHARLES HUNT, Esq. (President of the British Association of Gas Managers), in his Inaugural Address to the members at their annual meeting, held in London, June, 1880, said: "Rivalry has stimulated into being, for outdoor purposes mainly, Burners of large power, that have fully maintained the superiority of coal gas over the electric light. To Mr. Bray our thanks are due for his development of the FLAT-FLAME BURNER into a lighting medium of a very high order, *and for his vindication of its claims to practical consideration.*"

The above declaration was received with marked applause by the crowded meeting.

BIRMINGHAM LAMP TESTS.

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candles power Lanterns of medium lighting power are being fixed.

The apparatus used in the above tests were all of our usual medium lighting power class, and the tests showed that we sacrifice a considerable amount of lighting power for general efficiency. The tests further showed that our 80*-candles* HIGHEST *lighting power burner yielded* 3·51 *candles per foot of gas—the quality being* 16·75 *candles* (3·35 *per foot*) *by the standard—which was a higher result than that yielded by any other flat-flame burner, though copies of our Slit-Unions, enlarged and improved by us Jan.,* 1879, *were used by our competitor; and higher than the* 80*-candles power Argands.*

NOTE.—The above is the most conclusive answer to the ever-changing and misleading statements which are being made by our competitor, with the object of taking from us the honours we have secured in open contest.

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

[**The above Lamps have Meters attached.**]

BRAY'S LANTERNS have been adopted by the Vestry of St. George, Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting.

Also more than 50 Towns and Vestries have adopted them, after a similar competition in most cases; and many private users. In all cases they are a pronounced success.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.

June, 1880.

THE

MANN & WALKERS' PATENT SCRUBBER

Extensive use.

The successful and extensive use of the Mann and Walkers' Patent Scrubber in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required.

By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained.

The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased.

The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required.

The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works.

There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

Reserve purifying power contained.

There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed.

The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee.

They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

8, *Finsbury Circus, London, E.C.*

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

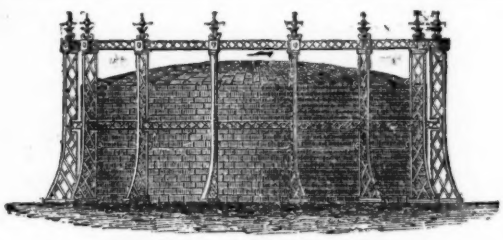
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, LONDON, E.C.,

HYDRAULIC ENGINEERS,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT STEAM-PUMPS,

More than 13,000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

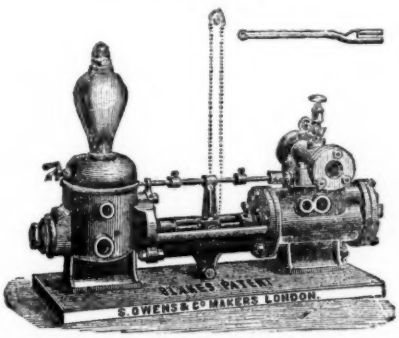
It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

It is compact and durable.



It is interchangeable in all its working parts.

It will deliver more water than any other pump.

It is made of best materials in the most workmanlike manner.

Can be worked at 20 strokes per hour, or 200 strokes per minute.

Upwards of 30 at The Gaslight and Coke Company's Works, Beckton.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

SOLE MANUFACTURERS OF

MANN & OWENS

IMPROVED PATENT GAS-VALVES.

PRICED LISTS AND FULL PARTICULARS FURNISHED ON APPLICATION.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

ALFRED LASS,

Fellow of the Institute of Chartered Accountants,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analysed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

THOMAS PROUD,

BROOKFIELD WORKS,

103, ICKNIELD ST., BIRMINGHAM,

MANUFACTURER OF

WOOD GRIDS

FOR

PURIFIERS AND SCRUBBERS,

AND

GENERAL STEEL AND IRON TOOLS AND MATERIAL USED IN GAS-WORKS.

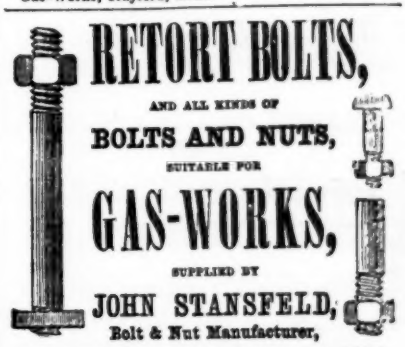
BOX'S PATENT STREET GAS-LAMP

Has the following good qualities:—

1. No putty or other material is required for glazing. Thus there is no hacking out of old putty on removal of the glass, with the *consequent damage* to the lamp frames. 2. No liability to breakage by unequal expansion of the glass caused by changes of temperature. 3. Any inexperienced workman can glaze the lamp in a few minutes. 4. The system of glazing can be applied to any existing lamp at a trifling cost. 5. It is cheap, strong, and durable. 6. The glass can be easily removed so that the frames can be thoroughly painted inside and out.

The lamp may be supplied fitted with clear opal or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing lamps to this system can be supplied at moderate prices and a small charge for royalty. Licences granted on the most reasonable terms. For further particulars apply to the Patentee, W. W. BOX,

Gas-Works, Crayford, Kent.



RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, ST. VINCENT STREET, GLASGOW.

TREES BOGHEAD.

SHOTTS BOGHEAD,

And all the first-class Scotch Cannels.

Prices and Analyses on application.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

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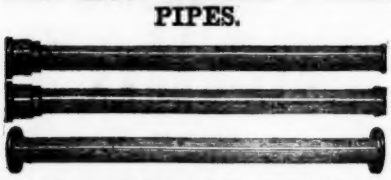

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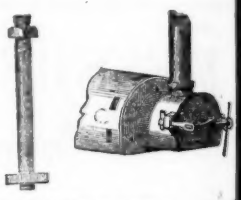

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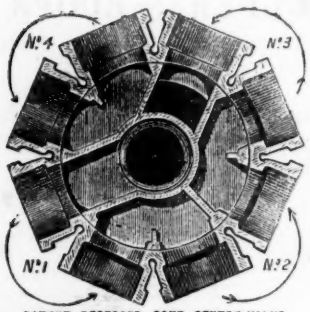

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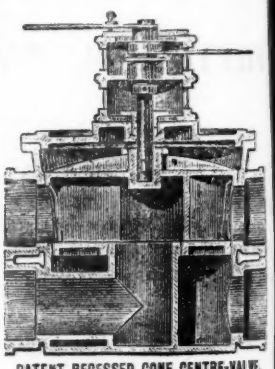

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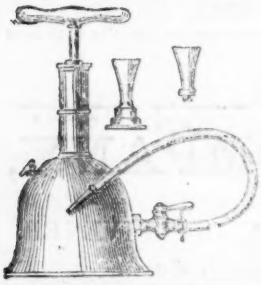

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